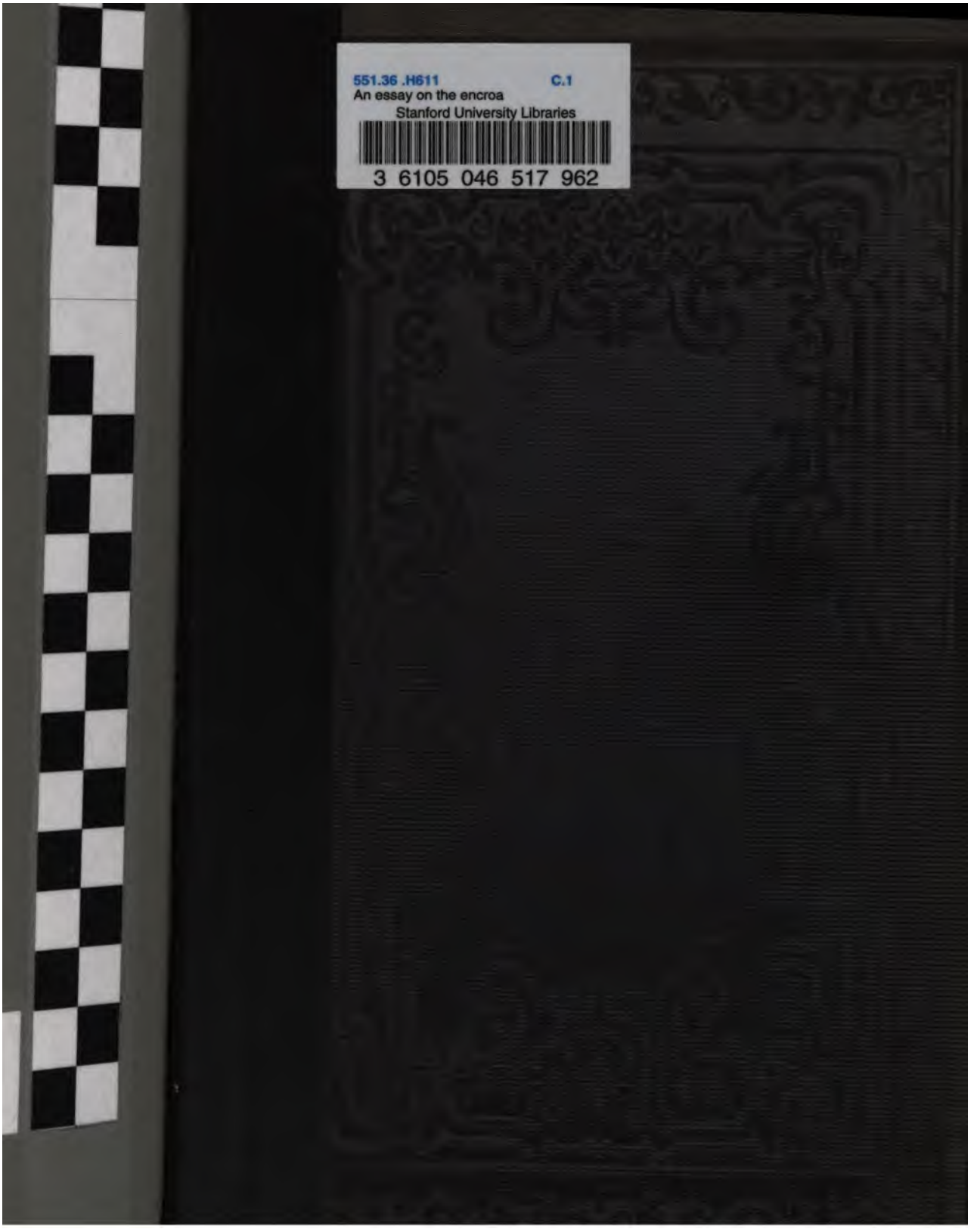

ECCLES CHURCH, THE PRESENT STATE OF THE BEACH AT HAPPISBURGH, NORFOLK.

AN ESSAY

ON THE

ENCROACHMENTS OF THE GERMAN OCEAN

ALONG THE NORFOLK COAST,

WITH

A DESIGN TO ARREST ITS FURTHER DEPREDATIONS;

DEDICATED

TO THE RIGHT HONOURABLE THE

LORDS COMMISSIONERS OF THE ADMIRALTY.

BY W. HEWITT, SURGEON.

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ECCLES CHURCH, THE PRESENT STATE OF THE BEACH AT HAPPISBURGH, NORFOLK.

AN ESSAY

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DEDICATION.

To the Right Honourable the Lords Commissioners of the Admiralty.

My Lords and Gentlemen,

A communication with your Lordships in 1843, led me to infer that an Essay upon the interesting subject connected with the present inquiry, would be received with a degree of attention according to its merits, and the importance of the object connected with it. But should you, in your superior wisdom, perceive sufficient evidence has not been advanced to render it deserving the consideration requisite at your hands, future proofs may arise upon the foundation contained in the following pages.—On the contrary, should it meet with your ap-

probation, the high and honourable position you maintain for the benefit of maritime affairs will, I trust, induce you to exercise your influence towards effecting a trial of the plan submitted, for the benefit of the community at large, and for the honour and credit of your noble establishment.

I am,

My Lords and Gentlemen,

Your very humble and obliged Servant,

THE AUTHOR.

PREFACE.

MANY persons may consider it a remarkable circumstance, that an individual, whose profession requires his leisure time to be devoted to the acquirement of knowledge for the comfort of man in his corporeal ailments, should find an opportunity to direct considerable attention to a subject, so very different in character, as the one now submitted to the reader.* The suggestions, however, of a near, respected, and venerable relative, aroused and stimulated me to make the strictest investigation, and subsequently led to the submitting a plan or de-

* The Author may probably, on a future occasion, communicate all the circumstances connected with the above, as they will afford an amusing, interesting, and instructive lesson, corroborating the testimony of the Poet,

"From little causes great effects arise."

sign for future benefit, not only to the mariner, the merchant, the ship-owner, to those whose landed property lies contiguous to the ocean, but what is of still greater consequence, the preservation of human life; and although an abler and a more experienced individual might have given a better statement, or submitted a better design, yet it is hoped sufficient will be found in this first and hasty attempt, to excite the attention of the learned and the wealthy.

An acknowledgment of the truth, a grateful feeling for the assistance derived for the most important particulars on this interesting subject, induces me to introduce the name, with the exertions of my venerable relative to the notice of my readers.

The Rev. John Hewitt, B. A., Perpetual Curate of Walcot, in this county, Vicar of Grantchester, and formerly a Fellow of Corpus Christi College, Cambridge, after several years of often repeated attention to the subject embraced in this Essay, expended in the year A.D. 1802 upwards of one hundred pounds in an attempt to fill up, at his own expence, the worst breach existing between Waxham and Horsey,

and the design to carry it into effect appeared so feasible, that to lessen the expence, the Hon. Harbord Harbord, the first Lord Suffield, lent implements to aid the undertaking. But unfortunately, prior to the task being completed, a strong north-west wind, upon a spring tide, ensued, and a quantity of water passed through the breach partially repaired.

A cottager residing near the place, witnessed the circumstance only just previous to the irruption of the water, and informed my relative had he possessed a shovel, he could have prevented it.

The circumstance attending this catastrophe caused in little minds derision and contempt, from the failure of the experiment. But a humble individual, whose ideas were more enlarged, contended upwards of three hundred pounds worth of good had been effected; and the spot on that part of the coast is recognized to this day as Hewitt's Bank.

While some persons, therefore, considered it a direct failure, my relative deemed it a partial one, and watched with undiminished ardour the effect produced by the stranding of the Hunter

cutter, A. D. 1807; the particulars of which are fully entered into in the following pages.

A knowledge of the tides and currents has been principally acquired from the perusal of several works of the most renowned philosophers, whose erudition have stamped them with truth stable and incontrovertible. I have, therefore, adopted their language rather than my own, fearful I should mar their intent, and my regard for such comprehensive writings induces me to add the truism transmitted to us by an ancient Latin author—

> Unius ætatis sunt quæ fortiter fiunt, quæ
> Vero pro utilitate scribuntur æterna.
>
> *Vegetius.*

Should the design be put in execution, and found efficacious, it will be applicable to other coasts, by taking every particular respecting them into consideration, and great will be the reward on the ambition attained of having endeavoured to benefit the community at large.

THE AUTHOR.

AN ESSAY

ON THE

ENCROACHMENTS OF THE GERMAN OCEAN.

CHAPTER I.

INTRODUCTION.—THE FORMATION OF THE TIDES CONSIDERED, THEIR VARIATION, AND EFFECTS.

> For, lo! the sea that fleets about the land,
> And like a girdle clips her solid waste,
> Music and measure both doth understand:
> For his great crystal eye is always cast
> Up to the moon, and on her fixed fast:
> And as she danceth in her pallid sphere,
> So danceth he about the centre here.

THE above lines, so beautifully expressed by one of our earlier poets, introduces a subject generally understood, but the important object connected with our present inquiry cannot be maintained without a thorough knowledge of cause and effect. A minute acquaintance, therefore, with the formation of the tides and currents, their variation and effects, transmitted to us by the observations, experiments, and discoveries of the earlier, and confirmed by the researches of the modern philosophers, will not be deemed altogether superfluous, as they will

tend to remove any obstacle that might otherwise present itself on the consideration of so difficult a subject.

By the term tide is meant that regular motion of the sea, according to which it ebbs and flows twice in the twenty-four hours.

After some wild conjectures of the earliest philosophers, observes Goldsmith, it became well known in the time of Pliny that the tides were entirely under the influence in a small degree of the sun, but in a much greater of the moon. It was found that there was a flux and reflux of the sea in the space of twelve hours and fifty minutes, which is exactly the time of a lunar day. It was observed that whenever the moon was in the meridian, or in other words, as nearly as possible over any part of the sea, that the sea flowed to that part, and made a tide there; on the contrary, it was found that when the moon left the meridian, the sea began to flow back again from whence it came, and there might be said to ebb. Thus far the waters of the sea seemed very regularly to attend the motions of the moon. But as it appeared, likewise, that when the moon was in the opposite meridian, as far off on the other side of the globe, that there was a tide on this side also, so that the moon produced two tides, one by her greatest approach to us, and another by her greatest distance from us; in other words, the moon, in once going round the earth, produced two tides, always at the same time; one, on the part of the globe directly under her; and the other, on the part of the globe directly opposite.

Kepler was the first who conjectured that attraction was the principal cause; asserting, that the sphere of the

moon's operation extended to the earth, and drew up its waters. But what Kepler only hinted, has been completely developed and demonstrated by Sir Isaac Newton.

After his great discovery of the law of gravitation, he found it an easy matter to account for the whole phenomena of the tides. The moon, like all the rest of the planets, has been found to attract and to be attracted by the earth. This attraction prevails throughout our whole planetary system; the more matter there is contained in any body, the more it attracts, and its influence decreases in proportion as the distance, when squared, increases. This being premised, let us see what must ensue upon supposing the moon in the meridian of any tract of the sea. The surface of the water immediately under the moon, is nearer the moon than any part of the globe is, and, therefore, must be more subject to its attraction than the waters anywhere else. The waters will there be attracted by the moon, and rise in a heap, whose eminence will be the highest where the attraction is greatest. In order to form this eminence, it is obvious that its surface, as well as the depths, will be agitated, and that wherever the water runs from one part, succeeding waters must run to fill up the space it has left. Thus the waters of the sea, running from all parts to attend the motion of the moon, produce the flowing of the tide; and it is high tide at that part wherever the moon comes over it, or to its meridian.*

But when the moon travels onward, and ceases to point over the place where the waters were just risen, the cause of their rising ceasing to operate, they will flow

* See Goldsmith's History of the Earth and Animated Nature, vol. 1, p. 146.

back by their natural gravity into the lower parts from whence they had travelled; and this retiring of the waters will form the ebbing of the sea.*

Thus the first part of the demonstration is obvious, since in general it requires no great sagacity to conceive that the waters nearest the moon are most attracted or raised highest by the moon. But the other part of the demonstration, namely, how there come to be high tides at the same time on the other side of the globe is not so easy to conceive. To comprehend this, it must be observed, that the part of the earth and its waters farthest from the moon, are the parts of all others that are least attracted by the moon; it must also be observed, that all the waters, when the moon is on the opposite side of the earth, must be attracted in the same direction that the earth itself attracts them; that is apparently quite through the body of the earth, towards the moon itself. This, therefore, being conceived, it is plain that those waters which are farthest from the moon will have less weight than those of any other part on the same side of the globe, because the moon's attraction, which conspires with the earth's attraction, is there least. Now, therefore, the waters farthest from the moon having less weight, and being lightest, will be pressed on all sides by those that having more attraction are heavier, and the heavier waters flowing in, will make them swell and rise in an eminence directly opposite to that on the other side of the globe, caused by the more immediate influence of the moon.†

In this manner the moon, in one diurnal revolution,

* See Goldsmith's History of the Earth and Animated Nature, vol. 1, p. 146.

† Ibid. p. 149

produces two tides; one raised immediately under the sphere of its influence, and the other directly opposite to it. As the moon travels, this vast body of waters rears upward, as if to watch its motions, and pursues the same constant rotation. However, in this great work of raising the tides, the sun has no small share, it produces its own tide constantly every day, just as the moon does, but in a much less degree, because the sun is at an immensely greater distance. Thus there are solar tides and lunar tides—when the forces of these two great luminaries concur, which they always do when they are either in the same or in the opposite parts of the heavens, they jointly produce a much greater tide, than when they are so situated in the heavens as each to make peculiar tides of their own; in the former, the attraction of the sun conspires with the attraction of the moon, by which means the high spring tides are formed; in the latter, the action of the sun is opposed to that of the moon, consequently the effect must be to depress the waters where the moon's action has a tendency to raise them, and hence the production of the lower neap tides.*

The spring tides† do not take place on the very day of the new and full moon, nor the neap tides on the very day of the quadratures, but a day or two after; the effect is neither greatest nor least when the immediate influence of the cause is greatest or least: as the greatest heat, for example, is not on the solstitial day, when the immediate action of the sun is greatest, but some time after it.—And although the action of the sun and moon were to

* Vide Goldsmith's History of the Earth and Animated Nature, vol. 1, p. 149.

† Upon this coast the swells continue greater three days after the new and full moon than when the latter is in her meridian.

cease, yet the ocean would continue to ebb and flow for some time, as its waves continue in violent motion for some time after a storm.*

Sir Isaac Newton has shown that the tides increase as the cube of the distances decrease, so that the moon, at half her present distance, would produce a tide eight times greater. Now the moon describes an ellipse about the earth, and of course must be once in every revolution nearer the earth than in any other part of her orbit; consequently she must produce a much higher tide when in this point of her orbit than in the opposite point.†

This is the reason that two great spring tides never take place immediately after each other; for if the moon be at her least distance at the time of new moon, she must be at her greatest distance at the time of full moon, having performed half a revolution in the intervening time; and, therefore, the spring tide at the full will be much less than at the preceding change. For the same reason, if a great spring tide happens at the time of full moon, the tide at the following change will be less.‡

The spring tides are highest and the neap tides lowest about the beginning of the year; for the earth being nearest the sun about the first of January, must be more strongly attracted by that body than at any other time of the year: hence the spring tides which happen about that time, will be greater than at any other time, and should the moon be new or full in that part of her orbit, which is nearest to the earth at the same time, the tides will be considerably higher than at any other time of the year.

* See Carey's Astronomy, p. 137. † Ibid. ‡ Ibid.

The tide which happens at any time while the moon is above the horizon, is called the superior tide, and when below the horizon, the inferior. When the moon is in the equinoctial, the superior and inferior tides are of the same height, but when the moon declines towards the elevated pole, the superior tide is higher than the inferior. If the latitude of the place and the declination of the moon are of contrary names, the inferior tides will be the highest. But the highest tide at any particular place is when the moon's declination is equal to the latitude of the place, and of the same name, and the height of the tide diminishes as the differences between the latitude and declination increases, therefore the nearer any place is to that parallel whose latitude is equal to the moon's declination and of the same name, the higher will be the tide at that place. In comparing the height of tides at different places, it is supposed that the sun and moon are at the same distances from the earth, and in the same position with respect to the meridian of these places.*

The above observations relative to the regularity of the tides could only result by supposing the earth to be covered with the waters of the ocean to a great depth, but as this is not the case, it is only at places situated on the shores of large oceans where such tides exist.†

From local circumstances the tides are subject to great irregularities, such as meeting with islands, headlands, passing through straits, &c. In order that they may have their full motion, the ocean in which they are produced ought to extend 90° from east to west, because that is the distance between the greatest elevation and the greatest depression produced in the waters by the moon.

* See Carey's Astronomy, p. 137. † Ibid.

Hence it is that the tides in the Pacific Ocean exceed those of the Atlantic, and that they are less in that part of the Atlantic which is within the torrid zone between Africa and America, than on the temperate zones on either side of it where the ocean is much broader.*

Tides are not perceptible in lakes and most inland seas, and deep and extensive as is the Mediterranean, are scarcely sensible to ordinary observation, their effects being quite subordinate to the winds and currents. In some places, however, as in the Straits of Messina, there is an ebb and flow to the amount of two feet and upwards; at Naples and at the Euripus, of twelve and thirteen inches, and Rennell informs us, at Venice, of five feet.†

The ebb and flow of the ocean is very slight in islands remote from any continent, as for example, at St. Helena, where it seldom exceeds three feet. Tides are remarkably high on the coasts of Malay, in the Straits of Sunda, on the open coast of Patagonia, along the coasts of China and Japan, at Panama, in the Gulph of Bengal, and at the mouth of the Indus, where the water rises thirty feet in height. Tides are greatest in any given line of coast, in narrow bays and estuaries; and are least in the intervening tracts where the land is prominent.‡

On the authority of the late Captain Hewett, R. N., at the entrance of the estuary of the Thames, the rise of the spring tides is eighteen feet; but when we follow our eastern coast from thence northward; towards Lowestoft

* See Lyell's Geology, vol. 2, p. 25. † Ibid.

‡ See Goldsmith's History of the Earth and Animated Nature, vol. 1, p. 150.

and Yarmouth, we find a gradual diminution, until at the place last mentioned the highest rise is only seven or eight feet. From this point there begins again to be an increase, so that at Cromer, where the coast again retires towards the west, the rise is sixteen feet; and towards the extremity of the gulph called "the Wash," as at Lynn and in Boston Deeps, it is from twenty-two to twenty-four, and in some extraordinary cases, twenty-six feet. From thence again there is a decrease towards the north; the elevation at the Spurn Point being from nineteen to twenty feet, and at Flamborough Head, on the Yorkshire coast, from fourteen to sixteen feet.

It is also recorded, on the authority of Captain Beaufort, R. N., that at Milford Haven, in Pembrokeshire, at the mouth of the Bristol Channel, the tides rise thirty-six feet, and at King-road, near Bristol, forty-two feet. At Chepstow, on the Wye, a small river which opens into the estuary of the Severn, they reach fifty feet, sometimes sixty-nine, and even seventy-two feet.*

The tides at Tonquin are the most remarkable in the world. In this part there is but one tide and one ebb every twenty-four hours; whereas in other places there are two. Besides twice in each month there is no tide at all, when the moon is near the equinoctial, the water being for some time quite stagnant. These, with other peculiar appearances attending the same phenomena, were considered by many as inscrutable; but Sir Isaac Newton adjudged them to arise from the concurrence of two tides, one from the South Sea, and the other from the Indian Ocean. Of each of these tides there

* See Lyell's Geology, vol. 2, p. 18.

come successively two every day; two at one time greater, and two at another that are less. The time between the arrival of the two greater is considered by him as high tide; the time between the two lesser as ebb. In short, with this clue that great mathematician solved every appearance, and so established his theory as to silence every opposer. This fluctuation of the sea from the tides, observes the same author, produces another and more constant rotation of its waters from the east to the west, in this respect following the course of the moon.

This may be considered as one great and general current of the waters of the sea; and although it be not every where distinguishable, it is nevertheless every where existent, except when opposed by some particular current or eddy produced by partial and local causes. This tendency of the sea towards the west is plainly perceivable in all the great straits of the ocean; as for instance, in those of Magellan, in South America, where the tide running in from the east nearly twenty feet high, and continues flowing six hours, whereas the ebb continues but two hours, and the current is directed to the west. This proves that the flux is not equal to the reflux, and that from both results a motion of the sea westward, which is more powerful during the time of the flux than the reflux. This motion westward has been sensibly observed by navigators in their passage back from India to Madagascar, and so on to Africa. In the great Pacific, also, it is very perceivable; but the places where it is most obvious are, as it was said, in those straits which join one ocean to another. In the straits between the Maldivia Islands, in the gulph of Mexico, between Cuba and Jucatan. In the straits in the gulph of Paria, the motion is so violent, that it has received the appellation

of the Dragon's Mouth. Northward, in the sea of Canada, in Waigat's straits, in the straits of Java, and in short, where the ocean on one part pours into the ocean on the other. In this manner is the sea carried with an unceasing circulation round the globe, and at the same time that its waters are pushed backward and forward with the tide; they have thus a progressive current to the west, which, though less observable, is not the less real.*

* Vide Goldsmith's History of the Earth and Animated Nature, vol. 1, p. 151.

CHAPTER II.

THE ORIGIN OF CURRENTS—THEIR VARIATION, EFFECTS, AND VELOCITY CONSIDERED.

ANOTHER impulse communicated to the waters of the ocean arises from its currents. These are caused by the winds blowing for many months in one direction, which produce on an expansive ocean movements of considerable magnitude: this may be easily conceived when we observe the effects produced on our own seas by the temporary action of the same cause.

A strong south-west or north-west wind invariably raises the tides to an unusual height along the east coast of England and the Channel. Smeaton ascertained by experiment that in a canal four miles in length, the water was kept up four inches higher at one end than at the other, merely by the action of wind along the canal; and Rennell informs us that a large piece of water, ten miles broad, and generally only three feet deep, has by a strong wind had its waters driven to one side, and sustained so as to become six feet deep, while the windward side was laid dry. He also observes, "As water, when pent up so that it cannot escape, acquires a higher level, so, in a place where it can escape, the same operation produces a

current, and this current will extend to a greater or less distance according to the force by which it is produced."

Currents flowing alternately in opposite directions are also occasioned by the rise and fall of the tides. The effect of this cause is, as before observed, in estuaries and channels between islands.

Evaporation by solar heat is another cause of oceanic currents, of which the great current setting through the Straits of Gibraltar into the Mediterranean, is a remarkable example. A stream of colder water always flows from the Black Sea into the Mediterranean. It must happen in many other parts of the world that large quantities of water, raised from one tract of the ocean by solar heat, are carried to some other, where the vapour is condensed, and falls in the shape of rain, and this, in flowing back again to restore equilibrium, will cause sensible currents. There is still another way in which heat and cold must occasion great movements in the ocean; a cause to which, perhaps, currents are principally due. It is now ascertained that there is in sea water no point, as in fresh water, at which an increase of cold causes the fluid to begin again to expand. In the ocean, therefore, whenever the temperature of the surface is lowered, condensation takes place, and the superficial water having its specific gravity increased, falls to the bottom, upon which lighter water rises immediately, and occupies its place. When this circulation of ascending and descending currents has gone on for a certain time in high latitudes; the inferior parts of the sea are made to consist of colder or heavier fluid than the corresponding depths of the ocean between the tropics. If

there be a free communication, if no chain of submarine mountains divide the polar from the equatorial basins, a horizontal movement will arise by the flowing of colder water from the poles to the equator, and there will then be a reflux of warmer superficial water from the equator to the poles. A well-known experiment has been adduced to elucidate this mode of action in explanation of the "trade winds." If a long trough, divided in the middle by a sluice or partition, have one end filled with water, and the other with quick silver, both fluids will remain quiet so long as they are divided, but when the sluice is drawn up, the heavier fluid will rush along the bottom of the trough, while the lighter, from being displaced, will rise, and flowing in an opposite direction, spread itself at the top. The expansion and contraction of sea water by heat and cold, have in a similar manner, a tendency to set under currents in motion from the poles to the equator, and to cause counter currents at the surface, which are impelled contrary to that of prevailing trade winds. The geographical and other circumstances being very complicated, we cannot expect to trace separately the movements due to each cause, but must be prepared for many anomalies, especially as the bed of the ocean must often modify and interfere with the course of the inferior currents, as much as the position and form of continents and islands alter the direction of those on the surface. Thus, on sounding at great depths in the Mediterranean, Captains Berard and D'Urville have found that the cold does not increase in a high ratio, as in the tropical regions of the ocean, the thermometer remaining fixed at about 55° F. between the depths of 1000 and 6000 feet; and Captain Smith has shown in his survey, that the deepest part in the Straits of Gibraltar

is only 1320 feet, so that a submarine barrier exists there, which must prevent the influx of any under current of the ocean cooled by the polar ice.

The rotation of the earth on its axis is another cause which can only come into play when the waters have been already set in motion by some one or all of the forces above described, and when the direction of the current so raised happens to be from south to north, or from north to south, the principle on which this operates has been long recognized in the case of trade winds; thus, when a current flows from the Cape of Good Hope towards the Gulph of Guinea, it consists of a mass of water, which, on doubling the Cape, in latitude 35°, has a rotatory velocity of about 800 miles an hour; but when it reaches the line, it arrives at a parallel where the surface of the earth is whirled round at the rate of 1000 miles an hour, or about 200 miles faster. If this great mass of water was transferred suddenly from the higher to the lower latitude, the deficiency of its rotatory motion, relatively to the land and water with which it would come into juxta position, would be such as to cause an apparent motion of the most rapid kind (of no less than 200 miles an hour) from east to west.*

In the case of such a sudden transfer, the eastern coast of America being carried round in an opposite direction, might strike against a large body of water with tremendous violence, and a considerable part of the continent might be submerged. This disturbance does not occur, because the water of the stream, as it advances gradually into new zones of the sea, acquires

* See Lyell's Geology, vol. 2, p. 34.

by friction an accelerated velocity. Yet as this motion is not imparted instantaneously, the fluid is unable to keep up with the full speed of the new surface over which it is successively brought; and Herschel, in his Treatise on Astronomy, observes, when speaking of the trade winds, it lags or hangs back in a direction opposite to the earth's rotation, that is from east to west;* and thus a current which would have run simply towards the north but for the rotation, may acquire a relative direction towards the west, or become a south-easterly current.†

The most extensive and best determined system of currents is that which has its source in the Indian Ocean, under the influence of the trade winds; and which, after doubling the Cape of Good Hope, inclines to the northward, along the western coast of Africa; then crosses the Atlantic near the Equator, and is lost in the Caribbean Sea; yet seems to be again revived in the current which issues from the Gulph of Mexico, by the Straits of Bahama, and flows rapidly in a north-easterly direction, by the bank of Newfoundland, towards the Azores.

Rennell informs us, that the Lagullas current, so called from the cape and bank of that name, is formed by the junction of two streams flowing from the Indian Ocean, the one from the channel of Mozambique, down the south-east coast of Africa, the other from the ocean at large.—The collective stream is from ninety to one hundred miles in breadth, and runs at the rate of from two and a half to more than four miles per hour. It is at length turned westward by the Lagullas bank, which rises from a sea of

* Treatise on Astronomy. † Lyell's Geology, vol. 2, p. 36.

great depth, to within one hundred fathoms of the surface. It must therefore be inferred, says Rennell, that the current here is more than one hundred fathoms deep, otherwise the main body of it would pass across the bank, instead of being deflected eastward, so as to flow round the Cape of Good Hope. From this Cape it flows northward, along the western coast of Africa, taking the name of the South Atlantic current. It then enters the Bight or Bay of Benin, and is turned westward, partly by the form of the coast there, and partly, perhaps, by the Guinea current, which runs from the north into the same great bay. From the centre of this bay proceeds the Equatorial current, holding a westerly direction towards the Atlantic, which it traverses from the coast of Guinea to that of Brazil, flowing afterwards by the shores of Guiana to the West Indies. The breadth of this current varies from one hundred and sixty to four hundred and fifty geographical miles, and its velocity is from twenty five to seventy nine miles per day, the mean rate being about thirty miles. The length of its whole course is about four thousand miles. As it skirts the coast of Guiana, it is increased by the influx of the waters of the Amazon and Orinoco, and by their junction acquires accelerated velocity. After passing the island of Trinadad, it expands, and is almost lost in the Caribbean Sea; but there appears to be a general movement of that sea towards the Mexican Gulph, which discharges the most powerful of all currents through the Straits of Florida, where the waters run in the northern part with a velocity of five miles an hour, having a breadth of from thirty five to fifty miles.*

The temperature of the Gulph of Mexico is 86° in sum-

* See Lyell's Geology, vol. 2, p. 24.

mer, or 6° higher than that of the ocean in the same parallel (25° N. lat.) and a large proportion of this warmth is retained, even where the stream reaches the 43° N. lat. After issuing from the Straits of Florida, the current runs in a northerly direction to Cape Hatteras, in North Carolina, about 35° N. lat. where it is more than seventy miles broad, and still moves at the same rate of seventy five miles per day. In about 40° N. lat. it is turned more towards the Atlantic by the extensive banks of Nantucket and St. George, which are from two hundred to three hundred feet beneath the surface of the sea; a clear proof that the current exceeds that depth. On arriving near the Azores, the stream widens and overflows, as it were forming a large expanse of warm water in the centre of the north Atlantic, over a space of two or three hundred miles from north to south, and having a temperature of from 8° to 10° Fahr. above the surrounding ocean. The whole area covered by the gulph water is estimated by Rennell at two thousand miles in length, and at a mean, three hundred and fifty miles in breadth, an area more extensive than that of the Mediterranean. The warm water has been sometimes known to reach the Bay of Biscay, still retaining five degrees of temperature above that of the adjoining ocean; and a branch of the gulf current drifts fruits, plants, and wood, the produce of America and the West Indies, to the shores of Ireland and the Hebrides.*

From the above statements, observes Mr. Lyell, we may understand why Rennell has characterised some of the principal currents as oceanic rivers, which he describes as being from fifty to two hundred and fifty miles in breadth, and having a rapidity exceeding that of the largest navi-

* Rennell on Currents, p. 58.

gable rivers of the continent, and so deep as to be sometimes obstructed and occasionally turned aside by banks, the tops of which do not rise within forty, fifty, or even one hundred fathoms of the surface of the sea.

The ordinary velocity of the principal currents of the ocean is from one to three miles per hour; but when the boundary lands converge, large bodies of water are driven gradually into a narrow space, and then, wanting lateral room, are compelled to raise their level. Whenever this occurs, their velocity is much increased. The current which runs through the Race of Alderney, between the island of that name and the main land, has a velocity of about eight English miles an hour. The late Captain Hewett found that in the Pentland Firth the stream, in ordinary spring tides, runs ten miles and a half an hour, and about thirteen miles during violent storms. The greatest velocity of the tidal current through the "Shoots or New Passage," in the Bristol Channel, is fourteen miles an hour; and Captain King observed, in his recent survey of the Straits of Magellan, that the tide ran at the same rate through the "First Narrows," and about eight geographical miles an hour in other parts of those straits.

The course of currents on the British shores is ascertained to be as winding as that of ordinary rivers. Sometimes they run between banks of sand, which consist of matter thrown down at certain points where the velocity of the stream has been retarded, but it very frequently occurs, that as in a river one bank is made of low alluvial gravel, while the other is composed of some hardy and lofty rocks constantly undermined, so the current in

its bends strikes here and there upon a coast which then forms one bank, whilst a shoal under water forms the other. If the coast be formed of solid materials, it yields slowly; so also if it be of great height, for in that case a large quantity of matter must be removed before the sea can penetrate to any distance.

Currents depend, like tides, on no temporary or accidental circumstances, but on the laws which preside over the motions of the heavenly bodies. The height to which tides rise, and the violence and velocity of the currents, depend in a great measure on the actual configuration of the land, the contour of a long line of continental or insular coast, the depth and breadth of channels, the peculiar form at the bottom of the seas—in a word, on a combination of circumstances which are made to vary continually by many igneous and aqueous causes, and among the rest, by the tides and currents themselves. Although these agents of decay and reproduction are local in reference to periods of short duration, such as those which history embraces, they are nevertheless universal, if we extend our views to a sufficient lapse of ages.*

Currents, observes Goldsmith, act their part in a smaller sphere, being generally greatest where the motions of the sea are least, namely, nearest the shores, and with the tides, produce the most rapid changes; their motion agitates the substances of which their bed is composed, and at the bottom of the sea, the greatest wonders are performed, for while the sea has been known to recede from some lands, so it has been found to encroach upon others,

* See Lyell's Geology, vol. 2, p. 37.

and probably these depredations on one part of the shore may account for the dereliction of another, for the current which rested upon some certain bank, having got an egress in some other place, it no longer presses upon its former bed, but pours all its stream into the new entrance, so that every inundation of the sea may be attended with some correspondent dereliction of another shore, where the sea meets no obstacles, it spreads with a gentle intumescence, till all the power is destroyed by wanting depth to aid the motion, but when the progress is checked in the midst by the prominence of rocks or the abrupt elevation of land, it dashes with all its force its depth against the obstacle, and forms, by its repeated violence, that abruptness of the shore which confines its impetuosity. Where the sea is extremely deep, and very much vexed with tempests, it is no small obstacle that can confine its rage; and for this reason, we see the boldest shores projected against the deepest waters, all less impediments having long before been surmounted and washed away. In places where the force of the sea is less violent, or its tides less rapid, the shores are generally seen to descend with a more gradual declivity. Upon these shores the sea seldom beats with any great violence, as a large wave has not depth sufficient to float it onwards, so that here only are to be seen gentle surges making towards the land, and lessening as they approach. As the sea, in the former description, is generally seen to present prospects of tumult and uproar, here it more usually exhibits a repose and tranquil beauty. Its waters which, when surveyed from the precipice, afforded a muddy greenish hue, arising from their depth and position to the eye,* when regarded from a shelving shore, were the colour of the sky, and seem

* See Newton's Optics, p. 163—167.

rising to meet it. The deafening noise of the deep sea is here converted into gentle murmurs; instead of the waters dashing against the face of the rock, it advances and recedes, still going forward but with just force enough to push its weeds and shells, by insensible approaches, to the shore.

CHAPTER III.

THE GERMAN OCEAN—ITS GEOGRAPHICAL POSITION—ITS TIDES—DISASTROUS EFFECTS IN COMBINATION WITH GALES OF WIND FROM THE NORTH-WEST ON DIFFERENT PARTS OF THE COAST UNDER CONSIDERATION—EXAMPLES.

THE workings of Nature itself, under the control of an Allwise and Omnipotent Being, ever exhibit a restorative as well as a destructive power. Its laws and constitution being no where directly revealed to us, are only to be inferred from the inspection of particular facts, obtained from observation and experiment, the only trust-worthy guides to the knowledge of Nature. Let us inquire—first, the cause of the German Ocean gaining upon the Norfolk coast? secondly, whether every portion is the subject of such visitation, attended with similar results? and thirdly, whether art can arrest its progress?

The German Ocean, from its being intersected with numerous shoals of sand, some of immense length and breadth, presents a greater variation in the tides and currents than probably any other ocean in the world; and from its exposure to variable and violent winds, renders the navigation extremely dangerous. Its extent in area is about two millions of square miles, and is confined within its narrowest limits between England and Holland,

and there in consequence the tides rise highest. It opens into the Atlantic on the north, and communicates with the English Channel by the Straits of Dover, and with the Baltic Sea by the Scaggerac and Cattegat. It may be considered as divided into two parts by the Dogger Bank, which traverses it in almost all its width, and a strong tide runs from north to south,* which is much increased by north and north-west winds.

From the earliest records to the present time, that portion of the coast extending from Cromer to Winterton-ness has been most subjected to the ravages of the ocean; lands have been swept away, buildings of considerable value have been swallowed up, and notwithstanding every effort hitherto made, the sea continues to advance in the interior as little satiated as before. The line of coast is extremely favourable to its rapacity, presenting, as it does, the appearance of a cape, and the different strata composing the cliffs are generally of too yielding a nature to resist its influence, even under ordinary circumstances.—The Hasborough Sands, extending from Winterton, to or a little beyond Bacton, must, from their dimensions and abrupt elevation, be a source of considerable mischief, confining a vast body of water within a narrow limit, which, when increased and disturbed by gales of wind from the north-west, upon a spring tide, urges the waves against the cliffs with a greater or less velocity, and with a force not only sufficient to sweep away large quantities of the earth, which, from the perpendicularity of the cliffs, is deposited at their base, but actually to undermine them to a considerable extent.

* The tide flows along this coast from north to south, and ebbs south-east, but exhibits great variation in different places; thus in the Lynn Deeps the tide flows south and ebbs north-east.

Numerous instances can be adduced where the current has taken away twenty-one yards of land from the interior in three tides; and it was computed when the present Inn was built in Lower Sherringham, near Cromer, in 1805, that it would require seventy years for the sea to reach the spot, the mean loss of land being calculated, from previous observations, to be somewhat less than one yard annually; the distance between the house and the sea was fifty yards, but no allowance was made for the slope of the ground being from the sea, in consequence of which the waste was naturally accelerated every year as the cliff grew lower, there being at each succeeding period less matter to remove when portions of equal area fell down. Between the years 1824 and 1829, no less than seventeen yards were swept away, and the distance between the house and the edge of the cliff at this time is only from eight to ten yards.

The whole site of ancient Cromer[1] now forms part of the German Ocean, the inhabitants having gradually retreated inland to the present situation, from whence the sea still threatens to dislodge them. The locality of this portion of the coast, the scarcity of sea beach material in the offing, the bed of the ocean of a rocky character, and the beach presenting nearly a level approaching a dead flat render it peculiarly liable to its invasion.

At Trimingham[2] upwards of fifty acres of land have been removed during the last sixty years, and on one occasion four acres and a half were taken away in one tide.

The property belonging to Mr. Wheatley, at Mun-

(1) See Appendix. (2) Ibid.

desley,[3] has become considerably reduced in extent and value, and has only been preserved to the present time by substantial walls erected next the sea, and numerous piles of wood driven into the sand beyond them: but what renders it most disheartening is, the sea has excavated the cliff at their extremity; and the probability is, should a heavy lasting gale of wind ensue from the north-west upon a spring tide, they, with perhaps the greater portion of the property, will be swept away by the water intruding behind and between them. Land attached to the estate of S. Bignold, Esq., adjoining Walcot[4] Gap, previous to 1839, was rapidly taken away.

At Hasborough,[5] the sea has encroached upwards of one hundred and seventy yards during the last sixty years, and it is calculated the church will be engulphed in the Ocean before the middle of the ensuing century.

The ancient villages of Shipden,[6] Whimpwell,[7] and Keswick[8] have entirely disappeared, and nearly the whole of Eccles.[9] A monument, however, still remains in the ruined tower of the old church, which is half buried in the dunes of sand. These have been fast encroached upon since 1839, laying bare the foundations of dwellings, the chancel end of the church, with a portion of a wall supposed to have surrounded the church-yard. The upper part of the buildings had evidently been removed previous to the foundations having been buried under the sand.

Hills of blown sand, between Eccles and Winterton,[10] extending to Yarmouth, have barred up and excluded the tide for many centuries from the mouths of several small

(3) See Appendix. (4) Ibid. (5) Ibid. (6) Ibid.
(7) Ibid. (8) Ibid. (9) Ibid. (10) Ibid.

estuaries; but there are records of nine breaches, from twenty to one hundred and twenty yards wide, having been made through these, by which immense damage was done to the low grounds in the interior. One of the most remarkable occurred in the year 1792, on which occasion a body of water passed through between Horsey[11] and Waxham,[12] extending beyond Hickling, a village situated three miles inland, which, uniting with the fresh water contained in a large lake, termed the Hickling broad, destroyed all the fish. The injury the land sustained in the immediate neighbourhood was very considerable; upon one farm a loss of upwards of three hundred pounds was experienced, and years passed by before the land recovered its former fertility. The effluvia arising from the subsidence or sinking of the water filled the air with malaria of the worst description. Intermittent and typhoid fevers of a most formidable character prevailed, so that many an individual was brought to a premature grave through this catastrophe.

(11) See Appendix. (12) Ibid.

CHAPTER IV.

REMARKS ON THE GERMAN OCEAN CONTINUED.—ITS RESTORATIVE POWERS ON OTHER COASTS DEMONSTRATED.—INCREASE OF THE SHOALS OF SAND OFF HASBOROUGH, CAISTER, &c.—THE SMALLER SHOALS OF SAND ALONG THE COAST—THEIR FORMATION AND EFFECTS CONSIDERED.

HAVING now brought together ample proofs of the destructive operations of the waves, tides, and currents upon our eastern coast, let us observe examples of their restorative power, in many instances aided and assisted by the hand of man.

The German Ocean is deepest on the Norwegian side, where the soundings give one hundred and ninety fathoms; but the mean depth of the whole basin may be stated at no more than thirty-one fathoms.* The bed of this sea is traversed by several enormous banks: one of which, occupying a central position, trends from the Frith of Forth in a north-easterly direction, to a distance of one hundred and ten miles; others run from Denmark and Jutland, upwards of one hundred and five miles to the

* Stevenson on the Bed of the German Ocean or North Sea.—Ed. Phil. Journ. No. v. p. 44. 1820.

north-west; while the greatest of all, the Dogger Bank, extends for upwards of three hundred and fifty-four miles from north to south.* The whole superficies of these enormous shoals is equal to about one-fifth of the whole area of the German Ocean, or to about one-third of the whole extent of England and Scotland.† The average height of the banks measures, according to Mr. Stevenson, about seventy-eight feet; the upper portion consisting of fine and course silicious sand, mixed with comminuted corals and shells.‡ Some long narrow ravines are found to intersect the banks. One of these varies from seventeen to forty-four fathoms in depth and has very precipitous sides: in one part, called the "Inner Silver Pits," it is fifty-five fathoms deep. The shallowest parts of the Dogger Bank were found to be forty-two feet under water, except in one place, where the wreck of a ship had caused a shoal.

These sands receive fresh increase every day; so that in time the place bids fair to become habitable earth.

The kingdom of Holland seems to be a conquest upon the sea, and in a manner rescued from its bosom. The surface of the earth, in this country, is below the level of the bed of the ocean; and I remember, observes Buffon, upon approaching the coast, to have looked down upon it from the sea, as into a valley: however, it is every day

* The Dogger Sands, in the North Sea, lie in the direction of a line drawn from Scarborough, in Yorkshire, to the coast of Jutland, terminating within fifty miles of the latter place.—On the 5th of August, 1781, an obstinate engagement took place immediately off this Bank, between the English and Dutch Fleets.

† Ed. Phil. Journ. No. v. page 44. 1820.—Stevenson on the Bed of the German Ocean or North Sea.

‡ Ibid.

rising higher by the depositions made upon it by the sea, the Rhine and the Meuse, and those parts which formerly admitted large men of war, are now known to be too shallow to receive ships of very moderate burden.

The formation of new lands by the sea's continually bringing its sediment to one place, and by the accumulation of its sands in another, is easily conceived. We have had many instances of this in England. The island of Oxney, which is adjacent to Romney-marsh, was produced in this manner. This had for a long time been a low level, continually in danger of being overflown by the river Rother; but the sea, by its depositions, has gradually raised the bottom of the river, while it has hollowed its mouth; so that the one is sufficiently secured from inundations, and the other is deep enough to admit ships of considerable burthen.

On many parts of the coasts of France, England, Holland, Germany, and Prussia, the sea has been sensibly known to retire.*

Instances of new lands having been produced from the sea are brought about by two different ways; first, by the waters raising banks of sand or mud where the sediment is deposited; and, secondly, by their relinquishing the shore entirely, and leaving it unoccupied to the industry of man.†

The quantity of sand, stones, &c., moved here and there by the tidal current is very considerable, and no given

* Buffon, vol. vi. p. 424.

† Goldsmith's History of the Earth and Animated Nature, vol. 1, p. 161.

line of the coast can afford a better example than the one under consideration.

The Hasborough Sands probably increase in breadth if not in length, since every year they receive fresh accessions from vessels buried in their vortex, which afford a nucleus for retaining the sand lodging against them.

The Cockle Sands, off Caistor,[18] have increased since 1836 one mile and a half in extent to the northward.

The deposition of sands, stones, shingle, &c., upon our coast, especially during the summer months, when easterly, southerly, and westerly winds prevail, would strike the beholder unaccustomed to witness the contrary effects, as an apparent impossibility, that the water could remove such an immense quantity of material especially in the short time that it does when a north-west gale prevails.

Shoals of sand of various length, breadth, and depth, appear and disappear, form and re-form, in the offing.—In north-westerly gales only are they solid, stable, and compact, and increase in breadth, while the materials on the beach are swept away. They extend in a direction parallel with the shore, and present an inclined plane, on each side of their base a corresponding shallow exists, and the tidal current will not allow materials to rest on their surface sufficiently to increase their elevation, and render them more efficient. As it is, however, they are natural breakwaters, but from their irregularity in extent, dimensions, and situation, they afford only a partial protection to the coast.

(18) See Appendix.

The incursions of the sea at Aldborough, in Suffolk, were formerly very destructive; and this borough is known to have been once situated a quarter of a mile east of the present shore. The inhabitants continued to build further inland, till they arrived at the extremity of their property, and then the town decayed greatly; but two sand-banks thrown up at a short distance, now afford a temporary safeguard to the coast. Between these banks and the present shore, where the current now flows, the sea is twenty-four feet deep on the spot where the town formerly stood.

Immediately off Yarmouth,[14] and parallel to the shore, is a range of sand-banks, the shape of which varies slowly from year to year, and often suddenly after great storms. The late Captain Hewett, R. N., found in these banks, in 1836, a broad channel sixty-five feet deep, where there was only a depth of four feet during a prior survey in 1822. The sea had excavated to the depth of sixty feet in the course of fourteen years, or perhaps a shorter period.*

Wherever a shoal of sand exists in the offing, at a distance beyond where the ebbing of the tide recedes to its greatest extent, denominated low water mark, there the innermost shallow will probably be: another shoal immediately forms, the base commencing at low water mark, and a gradual rise takes place towards the cliffs, terminating at or beyond the extent of the flowing of the tide denominated high water mark. Here, then, the shoal will be more efficient; the tidal wave and current will be checked and broken against the ascending bank.

(14) See Appendix. * Lyell's Geology, vol. 2, p. 54.

But should a shoal of sand form whose superior surface terminates at low water mark, the innermost shallow* will be observed nearer to, and its course frequently terminate in, an angular direction to the cliffs; and between the intermediate spaces of the shoals existing in the offing, a current frequently sets in towards the shore, which will aid the force of the tidal wave and current, when called into excessive action, in its attack either upon the cliff opposite, or a partial shoal nearest it. Under these circumstances, the one will soon lose its inclined surface, and the other will become undermined.

Where shoals of sand exist in the offing, there the beach is widest, and where they do not exist, there the beach is narrowest.

* The term shallow is applied by the Author to any hollow or cavity which may occur in the beach, and frequently designated a low or cane.

CHAPTER V.

MEANS TAKEN TO ARREST THE DEPREDATIONS OF THE GERMAN OCEAN BY PUBLIC AND PRIVATE INDIVIDUALS.—THE ERECTION OF JETTIES, PIERS, AND GROINS CONSIDERED.—THE BENEFICIAL EFFECTS ARISING FROM THE TWO FORMER AT YARMOUTH AND CROMER—THE PARTIAL FAILURE OF THE LATTER AT TRIMINGHAM, AND THEIR INJURIOUS EFFECTS ON OTHER COASTS DEMONSTRATED.

It appears, from the observations of Mr. Palmer and others, that if a pier or groin be erected anywhere on our southern or south-eastern coast, to stop the progress of the beach, a heap of shingle soon collects on the western side of such artificial barriers,* while on our eastern coast, sand, stones, &c., accumulate to the northward.

The plans hitherto pursued by public and private individuals have been to place abrupt perpendicular bodies, not to the southward of the property they have been most anxious to save, but have erected them directly opposite. Thus Mr. Wheatley, of Mundsley,[15] had the hulls of old vessels placed upon the shore at the base of the cliffs ad-

* Groins are formed of piles and wooden planks, or of faggots staked down, and they are used either to break the force of the waves, or to retain the beach.

(15) See Appendix.

joining his property; they were filled with large stones, secured with piles driven into the beach on either side, fore and aft, also by a strong chain cable, &c.; but a few years since they were entirely removed by the sea during a heavy gale of wind from the north-west upon a spring tide.

The town of Cromer,[16] on the same occasion, met with considerable loss. The jetty erected at the north end of the town caused a large mound of sand to accumulate to the northward of it, presenting an inclined surface towards the sea, and during the intervention of north-westerly gales, indigenous grasses sprung up, and covered the surface nearest the banks; this time, however, the jetty gave way, and the greater portion of the mound of sand was removed; but still there was sufficient left to convince the inhabitants, had the jetty been erected at the south end of the town, their property would have been saved.

In the erection of a groin at Trimingham,[17] a few years since, large square piles, about ten or twelve inches in diameter, were driven into the beach, at a right angle, to the base of the tall cliffs, and extended to or beyond low water mark; they were left projecting a considerable height above the then surface of the beach, and strong planks, fastened with iron bolts, were continuously attached to the tops of the projecting piles. The shallow existing must have been considerable in length, breadth, and depth; for subsequently a heavy sea, produced from a northerly gale, removed several of the piles entirely, and others were forced from a perpendicular to a horizontal position.

(16) See Appendix. (17) Ibid.

This circumstance, however, is readily accounted for, the strata into which the piles were inserted at a particular part, passed through blue clay into blue sand of a loose texture, and the piles were not driven to a depth necessary to reach or enter the solid strata beneath; now if we take into consideration the length and depth of the shallow, and breadth of surface presented by pile and plank, subjected to the full sweep of the tidal current from north to south, or rather at this point from east to west, aided and assisted by an increased flow of water from the Atlantic, we cannot be surprised at the result above mentioned. It was found necessary to support those left with additional piles placed horizontally on the west side. The effect produced by this costly groin was an accumulation of sea-beach materials to the northward, extending about thirty yards from the base of the cliff towards the sea, reaching to the top of the pile and plank; from thence an abrupt declination ensued, and terminated at the part from whence the piles, &c., alluded to had been removed.

Immediately to the southward of this barrier scarcely any accumulation of sea-beach materials had taken place, and the sea was committing greater ravages upon the cliffs adjoining than before.*

The plan of driving piles into the beach, for the purpose of retaining it, and encouraging materials to lodge on its surface, and consequently to break the force of the waves, has long been adopted on different coasts in England; and where a continuation of them has been practised, in certain localities, seem to have been attended

* This was observed by the Author in June, 1844.

with success; in others they have exhibited only a partial protection, from their temporary duration, and considerable inconvenience has been felt on coasts where shingle predominates, from pebbles pouring over in great numbers during heavy gales.

The immense quantity of sand displayed on this portion of the coast affords not only a different feature, but more gratifying results may be anticipated. In Yarmouth, the sea has not advanced upon the sands in the slightest degree since the reign of Elizabeth, and where the town is built became firm and habitable ground about the year 1008, from which time a line of dunes has gradually increased in height and breadth, stretching across the whole entrance of the ancient estuary, and obstructing the ingress of the tides so completely, that they are only admitted by a narrow passage, which the river keeps open, and which has gradually shifted several miles to the south.*

By the exclusion of the sea, thousands of acres in the interior have become cultivated lands; and exclusive of small pools, upwards of sixty fresh water lakes have been formed, varying in depth from fifteen to thirty feet, and in extent from one to twelve hundred acres.†

The benefit derived from the erection of piers at the Haven's mouth, has, in conjunction with the jetty, afforded great protection to the town of Yarmouth. The tidal wave and current has been checked, the shore has been elevated, retained, and rendered wider to the northward, as far as Winterton;[18] a shoal of sand has formed, and extends a considerable distance into the sea,

* Taylor's Geology of East Norfolk, p. 10. † Ibid.

(18) See Appendix.

at right angles to the shore, beyond the termination of the north pier, so that it has been found necessary to place a buoy at its extremity, as a guide for the mariner to steer due east from the Haven's Mouth to Yarmouth Roads. The jetty, extending into the sea upwards of four hundred and fifty feet, is now about to be added to, in consequence of the shallowness of the water.

The question now arises, would the jetty and piers have been so beneficial, had they not been continued into the sea to the extent alluded to? Certainly not. The shoals of sand, which formerly existed in the offing, have been removed, or rather have been converted into a solid mass; the current has been diverted from a southerly to a north-easterly direction, and the bed of the ocean nearest the shore has been elevated, and no doubt terminates into the sea upon an inclined plane.

The failure of groins, erected with pile and plank, appear to arise from their being placed in a wrong situation, from their not extending far enough into the sea, from the piles not being driven sufficiently into the beach, and from their sudden elevation, present an abrupt surface for the tidal wave to play upon, which during heavy gales of wind upon spring tides, cannot withstand its powerful effect, should the materials lying adjacent to or between them be removed. Therefore they can only be available where the interstices are completely filled with sea beach materials, and their durability must depend upon the latter cause.

CHAPTER VI.

THE RESTORATIVE POWER OF THE GERMAN OCEAN PROVED IN CERTAIN LOCALITIES.——ASSISTANCE GIVEN TO IT FROM THE STRANDING OF A VESSEL AT PURBECK, AND ON THIS COAST AT HASBOROUGH.—HILLS OF BLOWN SAND OR DUNES CONSIDERED—EXAMPLES OF THEIR STABILITY GIVEN AT WELLS, CLEY, &c., AND OF THEIR INSTABILITY AT ECCLES, PALLING, &c.—SEA-BREACH COMMISSIONERS APPOINTED.—THE ENGAGEMENT AND OPINIONS OF AN EMINENT ENGINEER IN 1804.—CONCLUDING REMARKS.

EXAMPLES of Nature endeavouring to combat with herself is shown from the immense quantity of sand, shingle, &c., brought from low to high water mark, during the summer months, and should easterly winds prevail, the sand is removed towards the cliffs, and accumulates in some situations more than in others. Thus at Walcot,[19] a deposition of sea beach materials commenced in 1839, and gradually augmented from six to eight feet in depth, within a distance of one mile and a half, and in a space comprising a few yards, it attained a perpendicularity above the cliffs, extending to high water mark, and the tidal wave, even in a northerly wind, ebbed and flowed without disturbing its surface, from the above period to No-

(19) See Appendix.

vember, 1843. A gale of wind then ensued from the north-west, upon a neap tide, which removed the greater part of the mound of sand, and a subsequent gale, upon a spring tide, in February, 1844, swept away the remainder.

A similar instance of accumulation was observed to have taken place on the Essex coast, commencing about the same period, and extended a distance of seven miles, which appeared in December, 1843, likely to remain.*

The flat shores at Wells[20] are considerably elevated above the depths of the ocean, into which they probably terminate in a gradual descent. The stranding of three large vessels off Winterton[21] and Horsey,[22] years ago, have possibly prevented its encroachments in these places.

When a vessel is stranded in shallow water, it usually becomes the nucleus of a sand-bank, as has been exemplified in several of our harbours, and this circumstance tends greatly to its preservation. Between the years 1780 and 1790, a vessel from Purbeck, laden with three hundred tons of stone, struck on a shoal off the entrance of Poole harbour, and foundered; the crew were saved, but the vessel and cargo remain to this day at the bottom.—Since that period, the shoal at the entrance of the harbour has so extended itself in a westerly direction, towards Peveril Point, in Purbeck, that the navigable channel is thrown a mile nearer that point. The cause is obvious; the tidal current deposits the sediment with

* Communicated to the Author by J. Brown, Esq., F.G.S.

(20) See Appendix. (21) Ibid. (22) Ibid.

which it is charged, around any object which checks its velocity. Matter also drifted along the bottom, is arrested by any obstacle, and accumulates round it, just as the African sand-winds raise a small hillock over the carcase of every dead camel exposed on the surface of the desert.*

Upon the 18th day of February, in the year 1807, the Hunter cutter,† during a heavy gale, struck on a shoal of sand in the offing, and finally drifted into a shallow near the shore, about a quarter of a mile to the northward of the old cart gap, at Hasborough, the stern part towards the cliff. In a very short time, sand, shingle, &c., accumulated around her, and completely filled the shallow to its utmost length. Within twelve months after, several shoals and shallows showed themselves opposite the town gap, evincing that the flowing of the tide had received a check, which proved an inconvenience to fishermen, as they had to heave their boats much farther before they could launch them into the sea; they were so aware that the Hunter cutter was the cause of this circumstance, that many a harsh expression did they utter towards her. In less than two years, more than one hundred yards could be paced from her bows on the ebbing of the tide to low water mark, and a large mound of sand accumulated between her stern and the cliff, which existed upwards of twenty years, and arrested the devastation of the sea directly opposite. From subsequent gales, how-

* See Lyell's Geology, vol. 3, p. 338.

† This vessel rests on her starboard side, and part of her ribs are visible on the ebbing of the tide in calm weather. Every soul on board met with a watery grave; and since that period the Ranger cutter foundered in a heavy gale on the outermost bank, and went to pieces, about a quarter of a mile to the south-east of the same gap, and every person on board experienced a similar fate.

ever, the cliffs were taken away to the northward, the water intruded behind the mound of sand, and entirely removed it. A greater proof of the check the waves had received was observed at low water mark, a ridge of gravel was deposited and left undisturbed on the ebbing of the tide, extending from the Hunter cutter to Bacton coal gap, a distance of three miles to the northward; the first spring tide, however, swept away nearly the whole of the ridge of gravel, except that portion nearest the Hunter cutter.

Although the benefit derived to the preservation of the cliffs from the stranding of the vessel has been entirely lost, still to the present time no shallows have formed immediately adjacent to her, and the beach would have been higher than it now is, had her bulwarks, taffrel, &c., not been removed.

The irruption of the sea, through the breaches in the dunes of sand,* in the neighbourhood of Eccles,[23] Horsey,[24] Waxham,[25] &c., having been attended with serious inconvenience and spoliation, caused a body of highly respected and influential gentlemen to be appointed Sea-breach Commissioners, and in the year 1804, they engaged an eminent Engineer, since deceased, who, among other information, gave it as his opinion, that if the shallows were all filled up, and the beach kept on an inclined plane, the sea would never gain on the Norfolk coast. He did not, however, point out how such an assertion could be substantiated, or submit a plan to

* These sand hills are composed of dry sand, bound in a compact mass by the long creeping roots of the plant called Marram (Arundo Arenaria); and such is the present set of the tides, that the harbours of Cley, Wells, and other places, are securely defended by these barriers.

(23) See Appendix. (24) Ibid. (25) Ibid.

effect so desirable an object; but the accident occurring to the Hunter cutter, the effects produced from her immersion in a cavity on the beach, the benefit in preserving the lands opposite for a long period, and the discontinuation of shallows forming in her immediate neighbourhood, at once indicate the truth of his assertion, and suggest the plan about to be submitted.

CHAPTER VII.

THE GENERAL FEATURES OF THE COAST.—THE VARIATION AND EFFECTS OF THE WIND FROM DIFFERENT POINTS CONSIDERED.

To combat successfully with so restless and powerful an agent as the ocean, requires great consideration and attention; for the obstacles presented on this coast are of no ordinary character. Among them may be enumerated powerful tides and currents, a confined space for a large body of water upon extraordinary occasions, cliffs of a soft yielding nature, a limited and irregular shore, with cavities and projections, either a dead flat or hollow descent from low water mark towards the cliffs, constitute a beach of the worst character. The shoals of sand in the offing, in certain localities, are numerous and irregular, their dimensions and situation variable, and while they afford a partial protection to the coast, are decidedly injurious to vessels liable to be stranded.

To make the sea subservient to our wishes, and agreeable to our design, in other words, to make it perform the duty of bringing its contents from the bottom of its waters towards the cliffs, to protect them, if possible, for ages, let us consider its auxiliary, the wind, the effects, whether beneficial or injurious.

The long-shore wind blowing from the north, but more particularly from the north-west, causes the water, upon a spring tide, to remove, as before observed, materials from the beach, to undermine the cliffs, and should a strong breeze have continued for two or three days previous from the south-east, and suddenly veer to the former point, a heavier sea will be the result on this part of the coast. For the waters of the ocean, having been kept back by the south-east wind, cannot escape so readily, had the superior force of what is commonly termed "the flood tide" from the north, a tidal wave derived from the Atlantic, not been checked. A small part of this wave passes eastward up the English Channel, and through the Straits of Dover, and then northwards, while the principal body of water, moving much more rapidly to a more open sea on the western side of Britain, first passes the Orkney Islands, and then turning, flows down between Norway and Scotland, and sweeps with great velocity along our eastern coast.

The lee shore wind, blowing from the north-east, removes the shoals of sand in the offing towards the shore, and wherever these find a resting place, from the suddenness of their removal, quicksands are sure to exist; fortunately, however, not to so considerable a depth as mentioned by the celebrated Scottish Bard, in the fate attending the Master of Ravensworth, but yet sufficiently alarming to render persons cautious how they venture upon their surface, especially on horseback. Some years since, on one occasion, after the formation of these sands, a vessel laden with timber, was stranded at Trimingham, near Cromer. A waggon and horses being employed to convey the timber ashore, became immersed, and the latter could not be extricated, on account of their being at-

tached to the waggon, until life was extinct. On the same day, a lady, riding on horseback between Horsey and Waxham, met with a similar accident, and was with difficulty released from her perilous situation. When the wind changes to another quarter, these sands disappear, and shoals are visible in their former situation.

Too often does the unfortunate mariner experience the bitter effects of quicksands in immediate connection with the large shoal off Hasborough: while the surface on its inner side is covered with water eighteen or twenty inches deep, within a short distance is as many fathoms. Between the spaces loose sands exist to a great depth; and, therefore, only those well acquainted with this circumstance, can possibly escape destruction, for should a vessel strike the fore part of her keel on the more solid portion of the shoal, numerous instances can be adduced where the stern has sunk foremost into the quicksands, and hull, masts, and every thing belonging to her, have been engulphed in a very short time, and sometimes, probably, before those on board have had an opportunity to make their escape.

An off-shore wind on this coast blows from west to south, and causes all heavy bodies, stones, &c., to be brought towards the shore; which are left between high and low water mark on the ebbing of the tide.

CHAPTER VIII.

THE GENERAL FEATURE OF THE CLIFFS CONSIDERED—CAUSES OF IRREGULARITY, AND THE GEOLOGICAL STRATA COMPOSING THEM.

THE cliffs* extending from Hasborough to or a little beyond Cromer, are found, upon approaching near, to be extremely irregular. In some places small promontories or points project, in others small bays are formed, according to the influence of the sea, and the materials composing their structure. Their perpendicularity is partially averted from the fallen masses deposited at their base; which, where the cliffs are lofty, are often considerable; arising either from the sand or clay beneath the more solid strata being removed; or the landslips which ensue, from fresh water springs abounding in certain localities. Thus, in the winter of 1825, a fallen mass was precipitated from near the light-house at Cromer, which

* The knowledge of the different strata composing the cliffs is derived from an interesting publication by the Rev. C. Green, Minister of Bacton Chapel, entitled the History, Antiquities, and Geology of Bacton, in Norfolk, published in 1842. The indefatigable and learned Author being about to publish a work upon the Geology of Norfolk generally, with an account of the Fossils, Bones, &c., deposited in its different strata, the minute details of their stratification has been avoided, as considered unnecessary for this publication.

While on the one hand there are evidences which prove the slow deposition of some of these strata, on the other there are proofs of great convulsions and derangement.

As a regular description of the separate strata may not prove uninteresting, let us inquire into the first—

Till.

This term is a provincial word, widely used in Scotland for similar masses of unstratified matter, which contain boulders; and the same term has been applied by Mr. Lyell to this part of the Norfolk strata.

The till is of a dark blue colour, somewhat resembling that of the London clay, and has been classed by some writers with that formation, because of the boulders with which it abounds. Mr. Woodward calls it blue clay. A positive distinction between this and the regular blue clay, however, must be made.

This till forms a large portion of the cliffs between Hasborough and Mundsley, rising in some places from twenty to nearly eighty feet in perpendicular height.—The whole of its organic remains appears to have been washed from other formations, to be deposited in it, and it contains, mingled with them, fragments of almost every rock of the secondary and primary series; comprehending immense blocks of granite, porphry, greenstone, oolite, lias, chalk, pebbles, trap, micaceous chist, sand-stones of various kinds, chert, marl, &c. Near Hasborough it is much intermingled with chalk.

The second stratum, as we descend beneath the till, is the

Crag.

A layer of which, between the watch-house and coal gaps at Bacton, has been termed by Mr. Lyell hard ferruginous crag. It consists of several thin plates, containing compressed wood, fragmentary and whole shells, intermixed with clay, gravel, and white sand. This bed forms a dip towards the north-west, having a support of red sand on the one side, and green sand on the other. A section of the crag is more largely developed at Cromer, Runton, and Weybourne. Between Bacton coal gap and Mundsley, vertical layers of crag occur, composed of thickly cemented fragments of shells.

Immediately beneath the crag occur those formations which are generally termed Fresh Water, consisting of lignite and lacustrine deposits.

Lacustrine.

At several spots between Hasborough and Mundsley, these deposits may be examined. They contain many species of shells, with fish and bones of mammalia.

The first of these occurs at a place called Ostend, between Hasborough and Bacton, about half a mile from the latter place. It is composed of bluish mud, with occasional patches of brown clay, and extends several yards along the beach. This formation was discovered by Mr. Green, in August, 1841.

About two hundred yards from the forest peat at Bacton, the second lacustrine bed occurs. It is confined to

occasional patches about the middle of the cliff, near the watch-house gap. The shells are deposited in thin layers of sand and blue clay, containing much wood, which appears as if bored by some insect.

The third lacustrine formation is at the village of Mundsley, and is distinguished from the other cliffs by its dark muddy appearance. Its height is about twenty feet, and it extends one hundred yards along the beach.

Mr. Lyell, referring to this bed, says, " It consists of brown, black, and grey sand, and loam mixed with vegetable matter, sometimes almost passing into a kind of peaty earth, containing much pyrites.

Lignite.

This name has been given to extensive forest beds, containing much carbonized wood.

The deposit prevails very generally along the Norfolk coast, and may be instructively examined at Hasborough, Bacton, Mundsley, Trimingham, and Cromer.

At Bacton extensive sections are laid bare after high tides. They are mostly formed of black peaty earth, which may be separated into thin layers, and has generally an aluminous taste, and abounds with pyrites.

At Bacton the depth of these sections, from the top of the cliff, is about five feet; at Ostend, between Bacton and Hasborough, about thirty, and at Mundsley, one hundred feet.

These deposits are occasionally mixed with masses of red sand, containing pipes of hard clay.

This formation presents the appearance of a wood, having been overthrown and crushed in sitû; for after strong north-west winds, the stumps of the trees may be seen really standing, with their strong roots extended, and intermingling with each other. In the winter of 1840-41, Mr. Green measured some of these trunks, which were then exposed about a foot from the root.—One measured five feet eleven inches round, and the other five feet.

Whilst at Bacton this bed is formed of black peaty earth, at Ostend it is mixed with a greenish sand. Mr. Lyell speaks of that at Hasborough as "laminated blue clay, about one foot and a half in thickness, part of the clay being bituminous, and inclosing compressed branches and leaves of trees.

Mr. R. C. Taylor, in his Geology of Eastern Norfolk, observes of the deposit generally:—"It consists of forest peat, containing fir cones and fragments of bones; in others of woody clay; and elsewhere, of large stools of trees, standing thickly together, the stems appearing to have been broken off about eighteen inches from the base."

The Rev. James Layton, cited by Mr. Fairholme in his Geology, states, in a letter, "the line of crushed wood, leaves, grass, &c., frequently forming a bed of peat, extends just above low water mark. About this stratum, numerous remains of mammalia are found, the horns and bones of at least four kinds of deer, the horse, the ox, hippopotamus, rhinoceros, and elephant. These fossil

remains are found at Hasborough and its neighbourhood, on the denuded clay shore. At Mundsley, they are found in the cliff. This stratum may be seen as the underlying formation, along the whole line of beach from Eccles to Mundsley."

At Cromer, Mr. Simons has observed, beneath the drift, several feet below high water mark, a bed of lignite, in which were found the seeds of plants, &c. He also observed ten or more trees, in the space of half an acre, exposed below the cliffs eastward of that town, the stumps being a few inches, all less than a foot, in vertical height, some no less than nine or ten feet in girth, the roots spreading from them on all sides, throughout a space of twenty feet in diameter.

Mr. Richard Taylor believes this bed, as visible at Hasborough, to be an extension of the well-known stratum at Watton cliff and Harwich. "There is," he says, "evidence sufficient to prove that it extends more south than Palling, even as low down as Winterton, and Caister; also at Lowestoft."

The two last strata nearest the chalk are the

Blue Clay and the Red Gravel.

These two beds "seem to have been deposited contemporaneously, as they are much intermixed, and every where contain the same species of mammalian remains. From the unusual quantity of bones contained in these strata, they have been provincially termed the Bone Rocks, but from the immense quantity of elephants' bones annually exhumed, they may, for the sake of distinction,

be termed the Elephant Beds." In some places the blue clay is deposited upon the red gravel.

The red gravel appears to be composed of rolled materials, which no doubt have been brought to this place from some distance. It comprehends a mixture of red sand and gravel, ferruginous and ochraceous nodules; blue clay, peat, sulphur, loam, flints, pebbles, masses of granite, porphry, fragments of and whole bones, and is much mineralized by iron.

These rocks are traceable to a considerable distance beyond Cromer.

The immediate bed upon which the strata rests appears to be

CHALK.

This is met with about half a mile north-west of Mundsley, about low water mark, and for upwards of a mile forms the beach. Near Trimingham three very remarkable protuberances, which rise up and form a part of lofty cliffs. Further northward, masses of chalk are included in the drift, or crop out in the interior, at a short distance from the shore, as at Overstrand, near Cromer, where a pit has been worked, in which the chalk is in a very disturbed and shattered state. At Cromer, the chalk has been again detected, and is every where the fundamental rock, lying about the level of low water, and rising on the north of that town, to the height of some yards above the level. At Sherringham it ascends above high water mark, and enters largely, from thence to Weybourne, into the strata of the cliffs.

From the appearance then of so much chalk in the immediate neighbourhood, and some of it apparently in an undisturbed state, as may be seen by its horizontal layers of flint at Sherringham, beyond doubt its existence may be concluded both to the east as well as the north.

In the year 1836, the humerus bone probably of the Great Mastodon, was found at Bacton, after a very high tide, one side of which, from the appearance it presents, must have reposed upon chalk. This bone was discovered in the red gravel, which, in many places, is the nearest bed to the chalk. Fragments of chalk are attached to the bone.

In the early part of this year the tibia probably of the same animal, was exposed, and obtained after a high tide by Mr. Green, in whose possession it still remains.

CHAPTER IX.

OBSERVATIONS UPON THE CLIFFS CONTINUED.——LAND-SPRINGS, THEIR INJURIOUS EFFECTS, WITH PLAN TO COUNTERACT THEM.—REDUCTION OF THE CLIFFS CONSIDERED ADVISABLE, ESPECIALLY WHERE GREAT IRREGULARITIES IN SAND DUNES EXIST, WITH A PLAN TO INCREASE THEIR HEIGHT WHERE NECESSARY.

HAVING considered the cliffs with respect to the contour they present, the different strata composing their structure, the injury they experience from the atmospheric air, from drought, from heavy rains, from severe and successive frosts, and from the formidable visitations of the German Ocean against their base; yet, they possess an internal enemy peculiar to themselves, which in certain localities is more formidable than the ocean itself—these are the Land-springs previously alluded to.

To check their baneful influence is a task that requires consideration, for although we know their existence, we cannot tell whether they arise from a broad or a narrow surface, at a great depth, or at a considerable distance from whence they are seen to issue; and although so serious in their consequences, yet the extent arising from such contingencies, on this part of the coast, is generally limited.

Wherever they abound, the cliffs ought, where practicable, to be reduced from a perpendicular to an inclined plane; then let stakes, or rather strong piles, be driven in a parallel direction to the extent required, and sufficiently deep into the solid strata beneath, at short distances one from another, with splines fastened horizontally, or what would be preferable, strong wooden faggots interposed between the piles and the cliffs, especially where the materials consist of a loose texture; these would be found efficient, until a more natural, solid, and lasting support could be obtained.

Great benefit might be derived by sinking wells on the inner or land side of the cliffs, subjected to their influence; for at Trimingham, the loss of four acres and a half of land, mentioned in a previous chapter, is primarily attributed to a foolish individual, who a few months before filled up three wells in the immediate neighbourhood.

The question now comes—would it not be advisable to remove generally, where practicable, the taller cliffs?—Possibly it would.

1st. The air in heavy gales of wind would not be so much condensed against their base, and add so much weight to the waves when nearing the shore as is now evidently the case, and the latter would be less liable to disarrange the legitimate beach during its formation.

2ndly. Wherever land-springs abound, an egress for the fresh water would ensue, without causing shoots of land to take place, where the former exist beyond or rather above the reach of the stakes recommended, which might retard the formation of the legitimate beach.

3rdly.—It will be decidedly applicable, where dunes or hills of blown sand from their irregularity, produced from the north-east winds, are reduced to an extent liable to admit an irruption of the sea, observable at Eccles, Palling, &c.

And lastly. The application of a plough in a locality where such fissures exist, upon the plan recommended in the ensuing chapter; and due attention to the transplanting the marram* from time to time as required, will accomplish the rest without directly interfering with the land belonging to private individuals on the inner side of those banks.

* This valuable variety of grass would, the author thinks, become more serviceable, if, on attaining its full growth, known by the ears containing the seed being ripe, it were mown down. The advantage derivable would cause the blades to spring up much thicker than they now do, and the seed being threshed, might be sown in any locality requiring its presence; and it evidently appears to be the easiest and most certain method to propagate it.

CHAPTER X.

THE AUTHOR'S PLAN FOR EVENTUALLY COUNTERACTING THE INJURIOUS EFFECTS OF THE GERMAN OCEAN ALONG THE EASTERN COAST OF NORFOLK, COMPRISED WITHIN A DISTANCE OF THIRTY MILES, EXTENDING FROM WINTERTON-NESS TO OR A LITTE BEYOND CROMER.—A PLAN FOR THE ERECTION OF JETTIES SUBMITTED, &c.

THE knowledge gained upon this interesting subject, the instances adverted to in the former chapter, prove almost beyond a doubt, that the question—Whether art can arrest the progress of the German Ocean along the Norfolk coast? may be answered in the affirmative.

The first and greatest desideratum necessary to be obtained is a bold shore, formed by a legitimate beach, a term applied by the eminent engineer, previously alluded to, who stated its ascent should be three inches and a half in the yard, which would realize seventeen feet and a half in one hundred and sixty yards; a height which no sea upon this coast could ever reach.

From there being plenty of materials in the offing, the ascent could be more gradual, which would be preferable, for a two-fold object must be kept in view; the one, for the preservation of the lands in the interior; the other, for the safety of mariners, should misfortune attend and

compel them to run their vessel ashore. Besides the more abruptly a body presents itself, whether natural or artificial, to the almost irresistible force of the tidal wave, when called into excessive action, the less it is likely to remain stable and compact. It will therefore be necessary to ascertain the extent of the shoals existing in the offing, and the elevation likely to be realized may easily be calculated.

A single row of piles driven into the beach at right angles to the shore, wherever a shallow exists, will be sufficient, with plank fastened to them, to encourage the materials, brought by the tidal wave and current, to be retained and lodged against them. The length of the piles necessary, must depend upon the supposed elevation required, taking into consideration, not only the depth of the sand lying at the bottom of the shallow, but also the strata beneath. In a very short time, by gradually adding the plank, the shallow will become filled up, and the tidal wave will pass over without disturbing its surface, the same plan must be adopted wherever a shallow exists at low water mark, but possibly the difficulty of applying the plank in that situation cannot be so easily accomplished; consequently a greater number of piles will be required, as they must be inserted near to each other.

After a shallow has been filled to the level of the beach then existing, and the upper part of the pile still projecting, let plank, if necessary, be gradually added about one or two feet in breadth at a time, as the deposition accumulates.

Proceeding onwards into the sea as opportunity offers,

some portion of the shoals will be removed into the shallows; another, probably, will be carried towards the cliffs. To facilitate this object, let a long tined harrow be fastened to the stern of a boat, which being urged by men, will loosen the materials on the surface of a shoal; and the flowing of the water will carry them, if the wind is in a favourable quarter, towards the shore, and thus will the beach become a consolidated body, with superabundant materials deposited at high water mark: these of course must be removed towards the cliffs. If the materials consist principally of sand, a plough might be employed with considerable advantage, turning the furrows inward towards the cliffs; on the contrary, should stones predominate, they must be deposited at the base of the cliffs. Easterly winds will remove the loose dry sand towards and fill up the spaces between them Many suggestions, however, to expedite the work will present themselves upon inspection and trial.*

The distance required from one row of piles to another must also depend upon circumstances. Wherever the sea reaches in, should a shallow or flat exist, there piles will be necessary, as well as to the southward of it, which will greatly accelerate the deposition of materials where they are so much required.

Discrimination will also be necessary in the application of the piles; for a minute and continuous observer will perceive it frequently happens, the alteration of a current and the wind favouring it, the sea will reach in towards the cliffs, and undermine and excavate one locality, while

* It is scarcely necessary to observe, until the legitimate beach is formed, stones, sand, &c., must not be taken away, and afterwards only with discrimination.—See Appendix. *Eccles.*

D.Hodgson, del.t

C.Graf, Lith. to Her Majesty.

THE BREAKWATER, SHEWING THE SUPPOSED ELEVATION OF THE BEACH FROM THE DEPOSIT OF SAND.

another, previously visited, will become filled up by materials dislodged from the former place.* In the latter instance, piles will not be required to be applied immediately, for probably some of the materials, irregularly accumulated, will be requisite to be shifted to their former situation. Hence the reason of applying piles to the southward and not to the northward of a locality requiring immediate assistance.

Again, considerable difference in the insertion of the piles must be made according to the contour the beach presents; between a distance continuously flat, and a shallow that only requires to be filled up. In the latter a few piles inserted from west to east, will answer extremely well; in the former, an opposite direction must be pursued; that is, from the south-west towards the south-east, according to the accompanying plate, for the sweep of the water must be taken into consideration, and also the necessity for encouraging sea-beach materials to accumulate to the southward of a groin, as well as to the northward. Upon this our final success depends.

While the above plan presents the least resistance to the tidal wave when most agitated, the tidal current will be checked and rendered powerless, and the gradual elevation, from the deposition of materials, will produce the effects exhibited by the breaking of the waves on a shelving shore; and, as they roll onwards, their power

* Examples observable at Eccles, the cliffs opposite the lower Lighthouse at Hasborough, off the high lands Hasborough, Ostend Point, Walcot, a point off a remnant of the parish of Keswick, off the Watch-house, Bacton, Cox's Point, Mundsley, Trimingham, Cromer, &c., in some instances scarcely ever any sea-beach materials accumulate, and the water reaches the cliffs at half-tide, especially upon the springs.

will become diminished, by wanting weight and depth to aid their motion.

In several places on this beach, the sand, shingle, &c., do not exceed four feet in depth, and in some instances are still shallower; thus at Cromer, a large body of calcareous deposition exists, and projects above the beach at low water mark; but between that and the cliffs, now temporarily protected by a sea wall, a shallow or cavity of considerable length and depth must have existed: this induced the inhabitants, who had witnessed the good the jetty had effected (previous to the injury Cromer sustained, and alluded to in a former chapter), to insert a groin immediately to the southward, or rather westward, of the town, eighty-four yards in length.

The shallow or cavity became filled up to the top of the groin, and a quantity of sea-beach material, consisting principally of sand, seemed disposed to accumulate against the base of the walls in June, 1844, but unfortunately the groin was not sufficiently extended towards the sea; the piles, instead of projecting above, did not equal in height the mound alluded to, and consequently it is not so efficacious as it would otherwise have been.

The jetty too has some influence towards prohibiting a still further proof of the efficacy of this groin, at least along shore to the northward, or rather eastward; for rude in construction, it is ill calculated to effect a two-fold object, which ought to arise from it. The platform resting upon piles of huge dimensions in height and diameter, appears to have been one continuous length, from the base of the cliffs to the elevated rock at low water mark. Its considerable altitude above the surface of the

beach, its unwieldy structure, from the timbers employed, and above all, its extent towards the sea being limited, accounts for its partial destruction in the storm alluded to. The dashing of the waves against the piles, even in calm weather, gives an impetus to the water at their base, and produces eddies or whirlpools, which prevent sea-beach materials accumulating in the immediate vicinity.

The inhabitants, however, appear so far to have been aware of this circumstance, that in repairing the jetty, they had recourse to iron stanchions, presenting a flat surface towards the sea; but the same impediment to utility still exists.

Let us now consider whether a jetty could not be constructed to afford not only a delightful promenade, the necessary appendage to a frequented watering place, but the retention of sea-beach materials, and the consequent elevation of the beach.

For this purpose let wooden piles of English oak be employed, of requisite length to enter the solid strata beneath the surface of the beach. The extremity for insertion must be pointed and shod with iron, and the opposite end must be protected with a rim of the same material, which ought to project above each pile, so as to leave a cavity sufficiently deep to receive the one end of an iron pillar, about eight or more inches in diameter, if considered necessary; and the length of this iron pillar being determined, its upper part can be readily formed to support the wooden plank constituting the platform of the jetty, to which it can be fastened. Now, if the piles are inserted into the beach in a continuous range towards the sea, leaving a space between each pillar, from two

to three feet apart, it may readily be inferred, that the desirable object will be realized, and a permanent good will be obtained. The expense, in the first instance, will of course be considerable, but its durability and usefulness ought to supersede such an obstacle.

It is a source of congratulation to observe considerable economy in the expenditure which so great an undertaking requires, can be effected by using, in a general way, the Pinus Sylvestris, or red fir, grown in the neighbouring plantations;* these, if taken down in the winter months, trimming them, and depositing them in the sea, in readiness for insertion as opportunity suits, will retain their resinous properties in the greatest abundance, and prevent the exudation, which an exposure to the spring and summer months would inevitably produce. Upon the resin they contain their toughness depends, and by adopting the above plan, and using those small in diameter, the instrument necessary for propelling them into the beach, will not disturb the surface of the pile most exposed to its influence. The following instance will prove their durability, and that a careful insertion of the piles is only necessary to render their stability certain, even if extraordinary gales should cause the legitimate beach to be disturbed.

At Mundsley, several years ago, not within the memory of the oldest inhabitant, some fishermen drove four piles, six inches in diameter, into the beach, between high

* Loudon, in his Encyclopædia of gardening, informs us, the Pinus Sylvestris, commonly but erroneously termed Scotch fir, can be obtained much cheaper, and of a better quality, in Scotland than in England. It appears the soil is more congenial, particularly in some districts, where the wood equals in texture that grown in America.

and low water mark, for the purpose of forming what is termed a coy, for containing lobsters caught at sea, until an opportunity for their disposal occurred. To the piles were attached some boards, so as to form a square, within which was placed a box for their reception; and a piece of wood, fastened upon the top, prevented the box from being disturbed by the water. At length, however, it became disused, the boards attached to the piles gave way, but the latter still remain firmly imbedded in the strata beneath, and their tops are only visible when north and north-west winds prevail, the sand lying around, above, and between them being then removed.

The shipowner, and above all the hardy sailor, cannot but rejoice at the prospect of obtaining a broad beach upon an inclined plane, for should a vessel be driven on in ever so heavy a gale, instead of having to contend with the cheerless prospect now before them, rendered not only formidable, but terrible, from the numerous shoals existing on this coast, there would be only one, and the vessel would arrive at its destination in a more gradual manner; her keel would become almost immediately impacted in the sand to such an extent, as to render her steady; for the waves having to attain an ascent, would be checked in their career, and for want of depth, would neither be able to injure the vessel nor destroy the mariner: hitherto, the great power they possess has, in many instances, dashed the former to pieces after she had struck the beach, and the latter has been hurled towards it, either too suddenly, or by their rebounding, swept into the depths below; while he, poor creature, so long as consciousness or presence of mind exists, uses his feeble efforts to reach the blessed shore, but, alas! too frequently in vain; he either sinks, to be wafted to another,

a lifeless, mangled corpse, or arrives too late to be saved, even if the vibration of the heart exists, for want of proper accommodation and attention. If a legitimate beach could be once formed, a little exertion and assistance from those on shore, would be able to rescue him from the now almost inevitable destruction.

CHAPTER XI.

THE CONCLUSION.

Let not the plan proposed in the previous chapter make too hasty an impression, or cause the reader to be too sanguine as to the result, however it may bear the semblance to truth and reality; but, if upon inquiry, consideration, and inspection, it is found to originate in facts, not theory alone, let no longer time be wasted in delaying a trial of its efficacy than is really necessary.

For a series of years, the wondrous body of waters has committed most dreadful ravages upon this and other coasts, not only to the loss of property, but what is of far greater consequence, human life.

Many countries, that have been destroyed, bear melancholy witness to the truth of history, and show the tops of their houses and the spires of their steeples, still standing at the bottom of the water. The German Sea has advanced upon the shores of Holland near Catt, that the ruins of an ancient citadel of the Romans, which was formerly built upon the coast, are now actually under water. In Friezland and Zealand, there are more than three hundred villages overwhelmed, and their ruins continue still visible on a clear day. The Baltic Sea has by

slow degrees covered a large part of Pomerania, and among others destroyed and overwhelmed the famous port of Vineta.

One of the most remarkable inundations recorded in history, occurred in the reign of Henry I., which overwhelmed the estates of the Earl Godwin, and formed the bank now called the Goodwin Sands.

In the year 1546, a similar irruption of the sea destroyed a thousand persons in the territory of Dort, and a yet greater number round Dullart. To these accidents several more might be added; our own historians and those of other countries abound with them; almost every flat shore of any extent being able to show something it has lost, or something it has gained from the sea.

There are some shores on which the sea, where it has overflowed, and after remaining perhaps some ages, has again retired of its own accord, or been driven back by the industry of man, which, if applied in the case submitted, would, we earnestly pray, verify the words contained in the 5th chapter of the prophet Jeremiah, and the 22nd verse. And should this design be found to answer, who is there can deny that, by continued attention and perseverance, not only will the lands in future be protected, but those which now appear lost, may in after years be regained, and that the saving of human life will be considerable.

There are many lands in Norway, Scotland, and the Maldivia Islands, that are at one time covered with water, at another time free. The country round the Isle of Ely, in the time of Bede, about a thousand years ago, was

one of the most delightful spots in the whole kingdom; it was not only cultivated, and produced all the necessaries of life, but grapes also, that afforded excellent wine. The accounts of the time are copious in the description of its verdure and fertility, its rich pastures covered with flowers and herbage, its beautiful shades and wholesome air. But the sea breaking in upon the land, overwhelmed the whole country, took possession of the soil, and totally destroyed one of the most fertile vallies in the world; its air, from being dry and healthful, from that time became unwholesome, and the small part of the country, which by being higher than the rest escaped the deluge, was soon rendered uninhabitable from its noxious vapours. The island continued under water some centuries, till at last the sea, by the same caprice which had prompted its invasion, began to abandon the earth in like manner. It has continued for some ages to relinquish its former conquests; and although the inhabitants can neither boast the longevity nor the luxuries of the original possessors, yet they find ample means of subsistence, and if they happen to survive the first years of residence there, they are often known to arrive at a good old age.

On this coast several manors and large portions of the neighbouring parishes have been swallowed up; nor has there been any intermission, from time immemorial, in the ravages of the sea within a distance of twenty miles in length in which these places stood.

Many a poor fisherman has lost his life within sight of his parents, wife, and children, whose uplifted hands, streaming eyes, and shrieks of wild despair, proclaimed the pangs they endured, the agony they suffered, at losing

their offspring, their husband, their father; and this too, when the tenderest ties of affection endeared them to each other; on a sudden lost, gone for ever! leaving those behind, who, if not bereaved of their senses entirely, remain during their sojourn in this vale of tears, for ever broken-hearted and disconsolate. This gloomy picture may appear over-drawn; but, alas! it is too true and melancholy to think of, where such accidents are frequent, and likely to continue till time shall be no more. But there is a ray of hope, that the object which appears so difficult to accomplish, may eventually be attained by the industry of man, with the means given and transmitted from the acquisition of knowledge, through an Allwise and Merciful Creator. Let us earnestly pray that His blessing may be bestowed upon our humble endeavours, to the fulfilment of this or a superior design.

APPENDIX.

BACTON.

Bacton or Backton, termed in the Doomsday Book Baketuna, is situated about four miles and a half north-east by east of North Walsham. From bordering on the sea, it continually experiences its devastating effects, which is the more to be regretted, as the land, about 1600 acres, is extremely fertile.

The Church, dedicated to St. Andrew, is a neat edifice, situated on elevated ground, about a quarter of a mile distant from the sea; and the interior, though unadorned with costly monuments, contains several neat stones to record departed worth.

The venerable relic of Norman grandeur Broomholme Priory, generally termed Bacton Abbey, is situated in the centre of the village, and from its being in a better state of preservation than probably any other in this county, which possesses the astonishing number of one hundred and twenty-two, is ever a source of interest to the lovers of antiquity.

The architectural style of the Priory of Broomholme appears to be that of the Norman and the early or lancet gothic united.

The editor of the General History of the County of Norfolk says: "A part of its architecture is so entirely of the same style as Norwich Cathedral, that it can scarcely be doubted but they are of the same era."

The north transept, with its triforium arches, many of which still remain, bears some resemblance to those of Norwich Cathedral and the Church of St. Nicholas, Yarmouth.

The churches generally were built in the form of the latin cross, terminating at the end in a semi-circular apsis. The internal elevations consisted of three divisions, the lower arches—the triforium,

occupying the space between the vaulting and external roof of the side aisles—and the celestory.

The circular arched entrance north of the transept appears to be built of Caen stone, and though plain, attests the origin of at least this part of the building. To the east a very lofty arch presents itself of the early gothic.

The chapter-house has a very large window of the early pointed gothic, supposed to have been added in the reign of Henry the VII, but it appears of a much earlier date.

The arcades of the face of the interior walls are very plain and simple; and are intended to take off the effect of a large extent of plain surface as the windows are but small. This appears to have been general in all Norman architecture.

The chimney is very modern, as the builders of the middle ages gave the preference to warming their halls by a central hearth, leaving the smoke to blacken the roof and escape as it best might by an open lantern.

The niche in the north transept, which bears traces of the ornamental gothic, was probably added with other parts of the building, as the abbey increased in fame and opulence.

The following are the supposed dimensions of the various buildings, &c.:—

The church ..	112	feet
North transept	22	feet by 18 feet
Chancel.....	23	feet
Quadrangle ..	73	feet by 47 feet
Cloister.....	76	feet by 21 feet
Large hall ..	100	feet by 24 feet.

This priory was founded in 1113, by William de Glanville, in the reign of Henry the First, for monks of the order of Cluni, as a cell to Castleacre priory. Here the monks of the latter sent their junior brethren, when too much crowded at home, or refractory monks, to do penance for non compliance with monastic rules. Subsequently, Bartholomew de Glanville, who was Sheriff of Norfolk and Suffolk, confirmed the priory of Castleacre to this priory.—The first prior was inducted to the abbey in the reign of Henry the First, and the last in the reign of Henry the Eighth.

The monks attached to this establishment appear, according to early historians, to have derived great profit from a cross, said to have been made out of that part of the Saviour's cross to which the hands and feet were attached, particularly the part where it was most sprinkled with his blood; and Capgrave informs us, "that no fewer than thirty-nine were raised from the dead, and nineteen blind persons had their sight restored by it."

In this priory were also preserved the "girdle for Zona, and milk of the blessed Virgin, and fragments of the crosses of St. Peter and St. Andrew."

Such was the rage for relics in former times, that Mabillon, a Benedictine, complained that the altars were loaded with counterfeits; numerous spurious ones being every where offered to the piety and devotion of the faithful. He also observes, "that bones were often consecrated, which so far from belonging to the saints, probably never belonged to Christians!" To shew how far this fraud extended, the "girdle" of the Virgin Mary, said to have been possessed by the monastery of Broomholme, was shown to the visitors appointed by Henry the Eighth, in eleven different places.

The following "Legendary Fragment," written by an intimate friend of the Author's, may not be deemed inappropriate:—

Broomholme, thy ruined grandeur tells
  A saddening tale of man's decay,
It speaks how all his glories pass,
  How all his relics droop away;
How all his efforts fall a prey
  To Desolation's ruthless reign,
How all the records he would trace
  The hand of Time outblots again.

Thou hast looked forth for ages past,
  And seen the unwearying ebb and flow
Of yonder calm and azure sea,
  Glittering in summer's golden glow;
And oh! how many a winter's snow
  Hath wrapped thee in its spotless vest,
How many a Spring with cheerful hand
  Thy fair domain in beauty drest.

How oft within thy ruined fane
  Has many a haughty zealot knelt,
And muttered o'er some holy prayer
  His thankless heart had never felt:
Thou'st heard the groans of souls that melt
  With anguish and repentance cleft,
Who, though engulphed in blood and crime,
  Had yet the hope of mercy left.

Oh! could yon gloomy pile reveal
  The thousand tales its records bear,
And rend the dark mysterious seal
  That Time has fixed for ever there,

Perchance 'twould tell of pain and care,
The same unvarying round of woe,
The same dark chain of human ills
That links us all to life below.

'Twould tell of horrors dark and dire,
That well the sternest heart might thrill,
How man with rapine, sword, and fire,
Had wrought with zeal his brother's ill.
Strange that ungrateful man should fill
The cup of woe, for pride or pelf,
Yet madly, fondly, vainly hope,
To taste the streams of bliss himself.

'Twould tell how bright, to Childhood's eyes,
The glory of existence seems,
How swiftly life's ensuing hours
Lose one by one their golden gleams.
How fondly Hope's delusive dreams
The hearts of men with smiles enslave,
How those forlorn and weary here,
May learn to look beyond the grave.

And Fancy often wanders back,
Through Time on her enchanted wings,
To snatch one legend from the gloom
That age about thy ruin flings.
And thus Imagination sings
In fond conceit and varied lay,
With all a Poet's trembling pride,
"A tale of Broomholme's Abbey grey."

The northern blast is sighing now,
In every withered leafless bough,
The dirge of the departed year;
And the lone sea-bird's dismal wail,
That ever comes in storm and gale,
Foretells the gathering tempest near.

The gloom of night is deepening fast,
And on the wild and fitful blast
The stormy clouds like shadows fly;
And darkened by their rapid flight,
The pale and placid orb of night
Is shrouded from the seaman's eye.

The vivid lightning's transient flash,
And then the deafening thunder crash,
Proclaims the elemental war;

And when the lightning leaves the skies,
And when the rolling thunder dies,
  Hark, how the raging waters roar.

The wild waves that in wanton play
Fling to the winds their feather'd spray,
  But seem to mock the angry sky;
But seem to sport in maddening pride,
When all is dread and dark beside,
  And ghastly Death is hovering nigh.
* * * * * *
Morn: oh! how many anxious eyes
Have watched the live-long night for thee,
That from the threshold of the skies,
Now looks o'er a tempestuous sea;
The ocean that so softly bright
Hath mirror'd oft the Queen of Night,
In lustrous lines of liquid light,
And, oh! have looked so calm and fair,
As if no storm could gather there.
Like to those living lights that shine
So pure and placid from the eyes,
When at Religion's holy shrine
The humble soul in rapture lies,
And gloomy passions wake within,
That lead away the heart to sin;
Then all that looked so fair and bright,
So pure in its own sportive glee,
Becomes a torture and a blight,
And wilder than the raging sea.

The gale now slowly dies away,
With the approach of dawning day,
And every wave that chafes the shore,
Salutes the strand with sullen roar,
And on the beach in sadness flings
All that to Hope was once so sweet,
Like trophies which a warrior brings,
And lays them at his country's feet.
Records that blood and death had earned,
When mercy from her shrine was spurned.
Alas! when angry storms break forth,
And wake the waters into wrath;
Ah! then the treacherous heaving wave
Rolls over many a wanderer's grave,
And striving winds and foaming surge
Sing many a mournful funeral dirge.
* * * * * *
Oh, Heaven! that such a lovely form
Could brave so dread and fierce a storm,

That one so beautiful and frail
Could bide the harsh and bitter gale;
And she who angels might have kept
In hallowed watches while she slept,
Is pillowed on the sandy shore,
Her lullaby the waters' roar:
And frowning skies in sorrow spread
Their canopy around her head.

And now beside the maiden kneels
A messenger of fond relief,
One who with sweet religion heals
The wounded spirit's cankering grief;
And raises from the chilly sand
The form that cold and lifeless lay,
Sustains it with a trembling hand,
And wraps it in his mantle grey.
And from that frontlet wipes away
The wanton water's brackish spray.
And now her wild and anxious gaze
Is fixed upon his swarthy cheek,
And faint and feebly she essays
Her wonder and despair to speak;
And he who looked so calm before,
Is moved to tears of sorrow now,
That as he bends the maiden o'er,
Those drops of pity damp her brow.
He turns as though ashamed to own
His heart has soft and yielding grown.
And now is many an offer made
Of home and hospitable aid,
By those who throng around the maid,
To them the monk his charge commends,
With promises of bounteous pay,
And with a heart of trouble wends
His steps to Broomholme Abbey "grey."

* * * * * *

What charm is there in Nature's smile,
When Hope be dead the weary while,
Or what in all the world can please,
When aching hearts are ill at ease.
And, oh! what rapture could *he* feel,
Who left the fair and beaten track
Of sweet Religion's holy zeal,
And to the cold world wandered back;
Whose only oriflamme should be
The sanguine cross of Calvary.
Yes, he whose life had aye been spent
In self denial's lowly creed,

In turning sinners to repent,
And share the Abbey's thrifty meed.
Yes, he who taught that heavenly love
Should all absorb the anxious mind,
That hearts should look to hopes above,
And leave the thoughtless world behind:
Yes, he whose years though few had been,
In much of deep devotion past,
Who joy'd the smiling summer scene,
And braved the winter's bitter blast;
Yes, he who told how dear and sweet
Was holy influence to the mind,
Who walked the world with weary feet,
To succour helpless human kind;
Yes, he forgot for beauty's smile,
His oath to Heaven, his hopes above,
He gave his heart to pleasures wile,
And lost his soul for woman's love.
Yes, he forgot the lowly mien,
The holy mass, the rosary,
And all that he had ever been,
For hopeless love and misery.

Alas! that grief should ever wear
So pale a cheek with sorrow's tear,
That anguish and remorse should trace
Their furrowed lines on Beauty's face,
And early troubles lead the way
For dread disease and slow decay.
There is a canker of the breast
That pleasure cannot charm away,
When the young heart becomes a prey
To dread disquiet, and un-rest.
Day after day—day after day,
Along that smooth and sandy shore,
Did Herbert with fair Edith stray,
Oft listening to the angry roar
Of the wild ocean's troubled sound,
Till the fair earth had wandered round
The presence of the glorious sun;
And when the winter had begun
To shackle every limpid river,
And silence every gurgling rill,
And in the woodland on the hill
The aspen leaves had ceased to quiver,
And every minstrel in the wood
Was silent in its solitude,
Those lovely birds that gaily chanted
Their songs of gladness from the grove;
Ah! oft had Edith's bosom panted

With silent and supreme delight,
When they have woke the lovely night
With their melodious songs of love.
Ah! many and many a lovely eve,
Beneath the Heaven's bespangled roof,
Did her young heart delight to weave
The future like a fairy woof:
And with her Herbert by her side,
In the sweet hush of eventide,
When night-blown flowers of beauty rare
With perfume filled the stilly air;
Often in those delightful hours,
When the young dreamy heart of youth
Plucks many a wreath from Fancy's bowers,
And knits them on the brow of truth.
And once she said, with tearful eye,
With quivering lip, yet tender tone,
As if her weak and trembling heart
Were half afraid its fears to own—
"Herbert forgive, I know thou wilt,
Or else my heart the wish would rue,
Ah! if it bears the taint of guilt,
In mercy, Heaven, absolve me too.
When death with chilling hand shall sever
The souls that nought but death could part,
Herbert, a slow consuming fever
Is burning at my brain and heart:
I feel that death is calmly stealing
Over my senses, day by day,
Immortal longings and a feeling
Of rapture charms my pulse away.
Herbert, dear Herbert, my request,
My last sad dying wish would be,
That in the last embrace of death,
My rest may then be near to thee;
And by the willows that o'ershade
The streamlet on the woodland hill,
Our dust may be in sadness laid,
And, though in death, together still."
Down Herbert's cheeks the drops of woe
Coursed sad and slowly—whilst the maid
Her last and earnest wishes prayed.
It was a dread and bitter throe—
Such as fond hearts, when doomed to sever,
At once unheeded and for ever,
Pure ardent souls alone could know.
He clasped her to his aching heart—
Her brow, alas! how pale and chill;
An icy glaze is o'er her eye,
And yet her lips are quivering still.

Ah! what is all the world to him?
A sleepless night, a cheerless day,
Now those endearing eyes are dim,
And his twin spirit passed away.
Now what to him is hill or dale,
The summer's sun or winter's gale?
Alas! they only tell a tale
That wakes a sorrow in his breast,
Whispering o'er and o'er again,
That he *was* blest, supremely blest.
Autumn or winter, summer or spring,
What are they now to him?
He walks the earth like a withered thing,
Whose lamp of life is dim.

* * * * * *

The keenest pangs of mortal woes,
And Sorrow's agonizing throes,
The briny drops of Misery
That overflow the mourning eye,
When Hope has lost its faintest gleam,
Will make the sweetest Eden seem
A barren and unkindly waste.
Alas! how bitter to the taste
Is that dark cup Remembrance fills
With all the worst of human ills,
And crowns with pleasures past away.
As waters silently decay
The flinty rocks they hourly fret,
So does the wildness of Despair,
And the slow canker of Regret,
The weary human bosom wear.

In Broomholme's cloistered turret now
Herbert de Colville lowly lies,
And withered is his burning brow,
And haggard are his frenzied eyes;
Those wandering orbs whose meteor light
Shines wildly from their mortal spheres,
When Fever like a deadly blight,
The wavering sense with madness sears;
It fills the eye and rends the heart,
When Reason's heavenly rays depart,
And leave the mind so faint and dim.
That it had ever been to him,
To leave the Abbey's holy wall,
And from that sweet Religion fall,
That should have been his hope—his all,
When earthly scenes began to pall;
That he should learn the bitter truth,

When buoyant hours are all gone by,
That the wild erring steps of youth
Must be retraced, when health and prime
Have left the frame, and when the eye
Is dim with pain and misery;
When the lone heart is worn and weak,
And the untiring hand of Time
Hath written Manhood on his cheek.

And round about him watchful stand
The Brethren of that holy band,
Whose pure devoted lives are given
To work the glorious will of Heaven.
And their's is not a bigot's zeal,
Whose dear delight is but to heal
The souls that pant for sweet repose,
O'erwhelmed with sin and worldly woes,
To succour in the hour of need
The hearts that ache and inly bleed,
Whose crown of glory is the meed,
That Love upon the soul bestows;
The sweet rejoicing of the heart,
That well performs its mortal part;
And not ingratitude nor slight,
Nor the world's cold and biting scorn,
Contempt and scoffing hourly borne,
Hath power to dim the holy light
That Love around her votary flings,
For she can wrap them in delight,
And fan them with ambrosial wings,
When death with calm approaches steep
Their senses in eternal sleep.

* * * * * *

"Alas! 'tis not my lowly couch,
Nor Misery's unkindest touch,
No, nor the world so long forgot,
Although in grief remembered now,
Nor yet my lone and humble lot,
That made me what ye see me now.
She was perchance an erring light,
A beauteous wandering meteor flame,
That on my waking vision came,
To cross my pathway like a blight;
Or else a Heavenly spirit sent
From a diviner element,
Who left some star-lit world that lies
Far off in azure's seas than this,
To teach my spirit what sweet bliss,
Were in her home beyond the skies.

But yet she passed,—she drooped away,
Like a fair rose untimely blighted,
Like an Hymeneal altar lighted
On a fond bridegroom's dying day.
There was a flush upon her cheek,
That in my soul a sadness wrought,
A warning voice that used to speak,
The lesson of her life's decay;
There was a lustre in her eyes,
Like a celestial glory caught,
From some bright meteor of the skies.
There was a music in her tone,
Like the low wind of Autumn makes,
Through the lone woods in sadness sighing,
When the bright leaves and flowers are dying,
As if it sighed for their sweet sakes.
Although I know and feel she died,
Her form and voice are with me now,
These are the hands that from her brow
Were wont so often to divide
The tresses of her golden hair,
When the night winds had wanton'd there.
But when we wandered through the glade,
And heard the night bird on the bough,
Or side by side together prayed,
Is but a fading vision now."

* * * * * *

Broomholme's Abbey is old and grey,
And monks are kneeling the live-long day,
From matin time till eve;
Many and sweet are the Aves they say,
And many the souls they shrieve.
At midnight, censors were brightly swinging,
And slowly and sad was the requiem singing,
And masses are singing still,
For him they laid in the willow's shade,
By the stream on the woodland hill.

CAISTER.

Caister or Caistor, a pleasant village situated upon the coast, about two miles and a half to the northward of Yarmouth, possesses the remains of a Roman station, and the ruins of Caister castle.—A lofty circular tower and a large portion of the north and west walls belonging to the latter are very prominent. This is supposed to be one of the oldest brick mansions in England. It was erected by Sir John Fastolf, who was born here, or at Yarmouth, in 1378. He entered early in life a brilliant military career, and signalized himself by many acts of bravery during a forty years' campaign

under the English Regency in France, and history records, in the course of this period, he was made in the field of battle a Knight Banneret, a Baron of France, Knight of the Garter, Marshal of the Regent's Household, the King's Lieutenant in Normandy, and progressively appointed to various public offices. He subsequently returned to Caistor, and his liberality, munificence, and acts of charity were not equalled in the period in which he lived. He became a founder of religious and other edifices, a generous patron of learning, an encourager of piety, and a benefactor to the poor.

A quibble on the name of this truly great and eminent man has been raised by some authors, who supposed him to be the Sir John Falstaff, whom our immortal bard Shakspeare delineated in the humorous but abandoned character as constantly lounging about the court of Prince Henry (afterwards Henry the Vth. of England).—The poetical Falstaff was nearly threescore years of age at the battle of Shrewsbury, A. D. 1403, when the Norfolk hero was not more than twenty-five. The former ended his career soon after Prince Henry ascended the throne—the latter survived Henry the Vth. thirty-seven years, and died at Caistor in 1459.

CROMER.

Cromer, formerly a small market town, is situated nine miles N. N. W. of North Walsham, and on the verge of the German Ocean. At the Doomsday survey Cromer formed part of the lordship and parish of Shipden, a considerable village, which, with its church, dedicated to St. Peter, appears to have been swallowed up by the sea about the time of Henry the 4th. A patent to collect certain dues for the erection of a pier was granted in the 14th of Richard II. At neap tides, in calm weather, are still to be seen, about half a mile distant from the shore, large masses of wall, which are supposed to have belonged to the church alluded to.

Many large portions of land were washed away in 1611, previous to which the inhabitants expended considerable sums of money and ingenuity in a fruitless attempt to maintain a small harbour. In the winter of 1799, the light-house cliffs, projecting from the beach three hundred and twenty feet, made several remarkably large shoots, one of which brought with it half an acre of ground, and extended into the sea beyond low water mark. On January 15th, 1825, another large mass of earth was detached from the light-house hills, and fell with great force on the beach, extending in breadth above three hundred yards from the cliffs, covering an area of twelve acres, and containing, it was supposed, not less than half a million of cubic yards of earth. The fall of this enormous body was sudden and unexpected. A large stream of water issued from the bank

immediately after its fall, and discharged itself down upon the beach with great noise and violence. Early in the morning of August 19th, 1832, another large shoot of the cliffs occurred near the light-house, which threatened the destruction of that useful edifice. It was deemed expedient to erect another on the hill, two hundred and fifty yards inland; but the remains of the old one are still standing about three-quarters of a mile east of the town, where it was built of brick in 1719.

These immense landslips were almost entirely owing to the numerous fresh water springs abounding in this locality, but the damage the town of Cromer experienced, and referred to in Chapter III., was caused by the ocean, during a continuous gale of wind.

According to tradition, Cromer church, dedicated to St. Peter and St. Paul, is supposed to have been erected in the reign of Henry 4th, soon after the village of Shipden disappeared. It is a large and handsome edifice, built of flint and free-stone, in the Gothic style, with a fine tower 154 feet in height, and richly ornamented with sculpture. The west entrance, the north porch, and the chancel have been long in ruins, and very little of the latter now remains; and history informs us, that many of its ornaments were destroyed by Cromwell's soldiers, who converted it into barracks.

As a watering place Cromer richly deserves the celebrity it has attained; and the encomiums conferred by those who have visited it during the summer months, are certainly not exaggerated. Nature indeed, appears to have bestowed her favours with no sparing hand to render it a delightful retreat for the invalid—or those who require a relaxation from the noise and bustle of a city life—and for those who are desirous to prosecute their studies with ease and comfort, almost amounting to enchantment. The most fastidious could but be pleased with the beauty of the surrounding scenery—with the accommodation provided by enterprising individuals—with the civility and courteous demeanour of its inhabitants, who from the highest to the lowest grade, take every possible pains to deserve lasting esteem and friendship. The fishermen too are exceedingly well behaved, and their looks pourtray a contentment approaching to happiness, that indicates the labour attending their perilous vocation is rewarded.

The village of Shipden, with its church dedicated to St. Peter, which lay between Cromer and the sea, has wholly disappeared.

ECCLES.

Eccles by the Sea, nine miles east by south of North Walsham, was a hamlet of the great lordship of Hasborough or Happisburgh, from whence it is about two miles distant. It not only appears fast

sinking into oblivion itself, but also holds a fearful destiny over a large tract of valuable marsh land in the eastern division of the county, by reason of the inlet it may sooner or later afford to an irruption of the sea.

In the reign of Edward the Confessor it was held by Edric, a Dane of noble extraction, afterwards by Ralph, Earl of Norfolk, through whom it became forfeited to the Crown. William the Conqueror bestowed it upon Roger Bigot, whence it passed successively into the hands of William de Albini, ancestor of the Earls of Arundale, William le Parker, and several other noblemen of renown in the annals of chivalry.

Many curious privileges and customs the lords of the manor derived in those days—for we find in 33rd of Edward the 1st, 1305, William le Parker was entituled to receive wreck of sea, lagan, and vesting geld, customs, and other profits upon the sea and land, and of every crew of a ship or boat washing their nets in the said village after Michaelmas to Martlemas, an hundred herrings, and also a fee for goods, chattels, &c., coming to land by sea, without the help of the said William or his servant, or resting upon the land one day and one night; and if the said William or his men, &c., immediately after imminent danger, or after shipwreck, shall do their endeavour to save such things, then the said William shall have a third part of all such things, or the value of them, unless of his good will he will omit something, but must not be asked.—Among the land customs was the bed gild, and at every wedding, noble or ignoble, the lords of the manor had the privilege of consummating the nuptials of the bride, or receiving a fee instead. This indecorous system prevailed in some parts of Scotland not many years since.

These arbitrary laws, enacted in the earlier period of England's history, when ignorance prevailed, and barbarism allowed the honoured and the wealthy to impose exactions cruel and oppressive, on those beneath them, may possibly have in many instances, from humanity, been omitted. At all events, as knowledge advanced, we find that not only have those which pressed so heavily upon the poor industrious fishermen been cancelled, but that others have been reduced to an extent compatible with the necessary protection to property exposed to the pilferer, from lamentable accidents on the coast. And it is highly gratifying to observe, that until recently no murmur or complaint has been raised against the lords of the manor, and this is confined to two or three districts, and arose from the following circumstance:—From time immemorial, it appears, persons have been allowed to take whatever sea-beach materials they required for domestic or other purposes, without molestation

or the exaction of any fee. But the increasing demand induced individuals who were deputed by the lords of the manor to officiate in their stead, to apply for permission to charge so much per freight or load; which being granted, a pretty income has been realized from the hundreds of loads of sand, stones, &c., removed annually.—A curious coincidence, however, is connected with it. One of these deputy lords, a few years since, observed that the removal of sea-beach materials, within a given distance of the road or gangway to the beach, afforded an inlet for the ocean to undermine and remove the foot of the gangway to such an extent, that an expence was necessarily incurred, from time to time, in repairing it, besides the loss of land on either side of it. He therefore applied for permission to fix up a board in the vicinity, on which was printed—

"By order of the Magistrates.

"Notice is hereby given—Should any person or persons take away or remove any sand near the gangway and foot of the cliffs, he or they shall be prosecuted, and upon conviction, shall suffer the extreme penalty of the law."

But strange to relate, no sooner did the deputy lord receive permission to dispose of the sea-beach materials, than the board was taken down, and individuals are permitted to take them away, if not in the immediate vicinity of the gangway, at least at the foot or base of the cliffs.

Every remaining vestige of Eccles denotes antiquity. Ancient stone walls have been exposed within the last three years by the action of the sea, removing lofty sand hills, and the peasantry have picked up silver and copper coins of great antiquity. But a still stronger evidence of a remote period may be traced in the wells constructed with large unburned bricks, formed in a mould wider at one end than at the other, to adapt them to the true circumference of the well itself. It is quite clear the wells had been filled up with earth, and ceased to be used before the abandonment of the place, since near to every one of them is a stone well, built with mortar, similar to the churches, which possibly denotes the first step towards civilization in this country. It formerly contained two thousand acres of land, but so wasted by the incursion of the German Ocean, that the inhabitants, in their petition for a reduction of taxes, in the reign of James the 1st, complained they had then only fourteen houses and three hundred acres of land. The whole now comprises a few cottages, with the church tower, and one hundred and fifty acres of land. The church was dedicated to St. Mary.

History informs us, that the parish of Whimpnell, formerly situated

between Hasborough and Eccles, has been entirely removed by the sea.

HASBOROUGH.

Hasborough, denominated also Happisburgh, situated seven miles south-east of North Walsham, is a considerable village, containing a church dedicated to St. Mary. Its steeple, 110½ feet in height, stands on an elevated point of land, and is extremely useful to the mariner as a land-mark. In former days a large wooden cross presented itself a considerable height above and from the centre of the the steeple, which rendered it still more conspicuous, and prior to 1818 it became so decayed, that it was blown down. The inhabitants erected another in its stead, which, during a heavy tempest in 1822, unfortunately served as a conductor for the electric fluid, which demolished it, and also a large portion of the south-east buttress; the latter fell upon and passed through the roof of the church, on to the aile beneath. On this occasion the electric fluid set fire to the church, and had not the promptest measures been resorted to, it must have been destroyed.

Here also was erected, in 1791, two light-houses, the one a hundred and the other eighty feet high. The upper part of each terminates in a dome; immediately beneath is the lantern, and on the outside a platform, surrounded with iron palisading, whose verge consists of a flat piece of the same material. Some years since, an unfortunate individual, subject to mental aberration, while in an extremely excited state, walked on the top or rim of the palisading, round one of the lights. This feat he safely accomplished, and extraordinary to relate, it had the desirable effect to render him calm and collected for several years.

A lover of the picturesque would be amply repaid for the trouble taken to reach the platform, which, as before observed, describes a circle, the one half presenting, on a clear day, a beautiful marine view, the other a splendid landscape.

In the former, the ocean, as far as the eye can reach, exhibits a vast expanse of troubled water, imparting sound which murmurs discontent. Its bosom too, after northerly and north-easterly winds, is frequently bedecked with vessels bound to some distant port, and from their being so numerous, so variable in size and form, and gliding so near the shore, they produce a beautiful panorama, not surpassed on any other part of the coast.

From the latter is seen in the distance, the spire of Norwich Cathedral, Cromer and Winterton light-houses. The intermediate space presenting pretty scenery of hill and dale, with here and there a mansion surrounded with plantations. The spires of the village

churches too are numerous and conspicuous, and the ruins of antiquated buildings, especially the Priory of Broomholme, at Bacton, is a picture in itself inviting our thoughts to roam to by-gone times. —The lands divided with fences, neat and trim, and the fields, exhibit, during the summer months, the various colours of the ripening corn. Farm-houses located at uncertain distances, and the humble cottages of the industrious poor, present at once a *coup-d'œil* of the blessings conferred on industry and enterprize.

To the Geologist and the Antiquarian a fine field for research, and a glorious treat, is afforded them. Within a short distance to the northward are lofty cliffs, containing in the different strata, relics of animals; some similar to those in the present day; others that never existed in the memory of the oldest historian; and those which now exist only in the torrid zone. The shells of fish that only inhabit rivers whose waters have departed to other channels, whose beds have been covered up probably for ages, while the trunks of trees, and stumps, with their strong roots extended, are frequently exposed after strong gales of wind.

To the southward is old Eccles steeple, ready to be snatched into the briny ocean; at its foot, towards the sea, is the remaining portion of the sacred edifice, with other foundations, indicating where once had existed the humming noise of human beings, exercising their vocation for individual and collective benefit. On either side of the old steeple are capacious banks, where the marram grows spontaneously, whose long tufts conceal the wily rabbit and the timid hare. Here the weary may rest; the contemplative picture to himself scenes that are past, present, and to come. Here pic-nic parties, merry meetings, the young and old, may partake of a delightful recreation, which a wonderful yet beautiful world presents; containing the fountain from whence all Philosophy springs and ends, and embracing the evidence of an Infinite Being, in the grandeur and magnificence of Creation.

HORSEY.

Horsey next the Sea must have been formerly one of the most uninviting hamlets ever beheld. It lies between Waxham and Winterton, and is eleven miles north by west of Yarmouth. Its lonely situation, its containing a large lake, called Horsey-mere, and intersected with ditches of stagnant water, cannot render it even now prepossessing. And were it not for its complete exposure to wind from every quarter, it probably would be very unhealthy.—Such a singular aspect did it assume some years since, that an early historian, alluding to Horsey, recommended it to the notice of government, as being peculiarly adapted for prisoners of war, espe-

cially the French; observing they could be retained there readily, as there was only one road to it; and its growing roots in abundance, besides an innumerable quantity of frogs, the expense for maintaining them would be inconsiderable.

The present proprietor's highly respected ancestor, about fifty years since, purchased the manor, when it was of little value, being generally flooded, and having expended a considerable sum of money in draining the marshes, repairing the sea-bank, and making a road to Somerton, an adjoining village leading to Yarmouth, has rendered it one of the most fertile estates in the county.

On the sea-bank within the bounds of this parish is Little Waxham, a manor of 160 acres; but the village, and its church dedicated to St. Margaret, were swept away by the ocean many years ago.

KESWIC.

Keswic or Casewic, situated to the east of Bacton, appears to have been part of the manor, and extended to this pluce and Broomholme. In 1382, the church, dedicated to St. Clement, was standing, and when it became deserted cannot be determined.

Extensive ruins remained for several years, which were taken down on the day of the coronation of George the Third and Queen Charlotte, with the exception of a small portion, now forming walls to two or three cottages.

A considerable part of the village is now in the sea from the falling of the cliffs.

MUNDESLEY.

Mundesley is a pleasant village, situated about five miles north by east of North Walsham, and has considerably improved during the last few years, but, similarly to Bacton, to which it is annexed, is continually wasting by the sea. A villa erected by F. Wheatley, Esq., commands a beautiful marine view, but to preserve it from the rapacity of the ocean, upwards of three thousand pounds have been expended.

PALLING.

Palling next the Sea lies between Eccles and Waxham, and is about twenty miles north-east of Norwich. It is celebrated in ancient records as being the residence of Godwin, Earl of Kent, in the reign of Edward the Confessor. William the Conqueror afterwards seized on it, and at the grand survey, Godric was bailiff or steward of it for that king.

Within the last few months, the sea has removed the beach at low water mark, and exposed the strata beneath its surface. In it are the remains of the trunks and roots of trees; the former broken off from three to four feet above the strata, while around lie the remaining portions consisting of the branches, leaves, &c., but very much compressed. The bark of the beech is very distinct, but the oak, and especially the red fir, are in the best state of preservation. The wood of the latter has evidently undergone considerable chemical change, for the ligneous or fibrous part is very perfect, but its resinous properties are absent, consequently the wood when dried, is much lighter, and smells strongly of sulphur. It is impossible to ascertain how long the trees have been covered up, but probably some centuries.

TRIMINGHAM.

Trimingham is situated on the tall cliffs between Mundesley and Cromer, and five miles north by east of North Walsham. Like the former, it has been subject to the encroachments of the ocean for a series of years, and is now reduced to a small village. The church stands on the highest point of the cliffs; and history relates that its ancient priests professed to have the head of St. John the Baptist. Pilgrims came a long distance with great offerings, and thus became the dupes of superstition and deceit.

WAXHAM.

Waxham lies on the coast between Palling and Horsey, and is about fourteen miles north-west of Yarmouth. This parish was formerly much more extensive, and although it has not been encroached upon for some years, yet the sand hills appear evidently inclined to recede.

The church, dedicated to St. John, exhibits considerable dilapidation, the chancel end being quite in ruins. In the church-yard lies interred the remains of the unfortunate mate of the Hunter cutter.

WELLS.

Wells next the sea is situated five miles north by west of Walsingham, and 32 miles north-west of Norwich. It possesses a tolerably good harbour and several neat buildings, but its streets are very irregular. The church, dedicated to St. Nicholas, is a neat edifice, with a square tower. On July 15th, 1817, a gale of wind from the north produced so high a tide, that the marshes near Wells became inundated.

WINTERTON

Winterton is an ancient village, annexed to Horsey on the south, and within eight miles north by west of Yarmouth. It is sheltered on the north-east by a bold promontory called Winterton-Ness, and well known to the mariner as the most fatal headland between Scotland and London. The church, dedicated to the Holy Trinity and All Saints, possesses a fine tower, 118 feet in height, which commands an extensive view of the ocean.

On the 27th of December, 1665, a tremendous high tide caused such alarming breaches in the sand hills at Winterton, Horsey, and Waxham, as to threaten destruction to all the valuable marsh land from thence to Yarmouth, Beccles, &c.

YARMOUTH,

Frequently termed Great Yarmouth, is the principal sea-port town in Norfolk, and 123 miles distant N. E. of London. It stands on the east bank of the river Yare (from whence it takes its name), at its confluence with the Bure, about two miles from the mouth of the haven, which is very extensive and commodious.—From the appearance of the country, and an ancient chart, supposed to have been drawn about A D. 1000, it is evident that a broad and extensive estuary divided this part of the eastern coast, not only in the time of its most ancient inhabitants, but for a long period after the Saxon Conquest, extending its waters westward to the city of Norwich, northward to Caistor, Reedham, Herringby, and Strumpshaw, and southward to Gorleston, Burgh, Bungay, Harleston, and Haddiscoe This large arm of the ocean forming the grand receptacle of all the eastern waters of Norfolk (as it still continues under the circumscribed form of the Yare), began to disappear after the fifth century, when the sand collecting at its entrance, was, by the action of the waters, gradually formed into an island, which ultimately extended itself to the main land, and became the peninsula on which Yarmouth is founded. Several successive disappointments, and an immense outlay of capital in endeavouring to erect substantial havens for the guidance of the river waters into the sea, had been experienced, and at length finally accomplished by the erection of those beautiful piers and noble jetty. In 1528 the work was commenced, and on the 2nd day of March, 1559, men, women, and children, to the number of one thousand, were employed, and succeeded, in the short space of two days, in causing the water to issue forth into the sea, leaving a depth of ten feet at ebb tide. In

1567, the water forced a passage down the old channel, towards the village of Corton. After this disaster, a celebrated Dutch engineer was employed, who commenced his operations by driving and hedging down large stakes and piles, to make a firm substantial foundation; this was first done on the north and afterwards on the south side of the entrance, for the purpose of forcing the ebbing of the tide to run out by a north-east channel. The next step was the erecting of piers for preventing the haven from overflowing, and preserving, at all times of the tide, a sufficient depth of water for ships to float at their moorings. The jurisdiction of the haven includes that part of the sea called Yarmouth roads, extending northward to Scratby, and southward to Corton, in Suffolk.

Inundations, Shipwrecks, &c.

In 1287, St. Nicholas' Church was completely inundated by the sea, during a tremendous flood, that did incredible damage to the town, the greater part of which was under water.

In 1554, fifty sail of vessels was lost in one day and night, and the crews perished.

In 1692, a fleet of two hundred sail of colliers, having left the roads with a fair wind, were suddenly assailed by a tremendous gale from the north-east. After they had passed Winterton-ness, some of them tacked and arrived back safe in the roads; the remainder pushed out to sea, but were unable, through its violence, to clear the Ness to the southward. The night was exceedingly dark, and missing the lights, few could find their way; some rode out at a distance; but the rest, amounting to one hundred and forty sail, were driven ashore, completely wrecked, and scarcely any of the crews saved. At the same unfortunate juncture, a number of coasting vessels, laden with grain, bound to Holland, from Lynn and Wells, having just left the roads, experienced the same disaster; so that in the whole more than two hundred vessels and one thousand people were lost in twenty-four hours.

If vessels leaving Flamborough Head, proceed southward, and meet with a heavy gale from any point between north-east and south-east; or if leaving the Yarmouth roads, proceeding to the northward, they are retarded by the wind blowing hard from the north-east, so that they cannot weather Winterton-ness, they become embayed, and the only chance for safety is to run for the Lynn Deeps, in attempting which they are in danger of foundering on the rocks near Cromer, or stranding on the flat shores between Cromer and Wells.

In 1790, seventy sail of ships met with a similar fate, and also their crews.

In 1791, a raging tide inundated the denes and the meadows to such a depth, that boats rowed on Southtown turnpike.

In 1805, a tremendous storm at sea occurred, accompanied by a raging tide, which nearly destroyed the old jetty.

In 1825, a destructive tide ensued, which did much damage to the town. The water flowed nearly to the doors of some of the houses on the quays. The Southtown road was completely overflowed and rendered impassable, the lower apartments in several houses on the west side were under water, and much corn, grain, and other merchandize in the store-houses spoiled.

To do ample justice to the highly interesting records associated with this celebrated sea-port town, would form a volume in itself, and the ingenuity and embellishments displayed by its inhabitants, to be properly appreciated ought to be visited, to form a lasting impression of their industry. Situated on a narrow strip of land, less than a mile in breadth, and stretching five miles from north to south, it cannot boast of any pretty inland scenery, as the country is extremely flat, but it possesses resources interesting and inviting to the stranger.

Its harbour is excellently situated for affording shelter for vessels unable to contend against contrary winds. Its extensive traffic in coal and corn, and above all the celebrity it has attained for its herring and mackerel fisheries, must ever render it a place of the greatest importance. As a watering-place its merits must not be forgotten. Splendid edifices and admirable accommodation have been provided near the sea-shore, enabling its visitors to partake of "delightful breezes to their hearts' content," or to mingle with the gaieties of a city life. As a naval station during the late war, it proved highly advantageous; and in accordance with that circumstance, a beautiful Monumental Pillar was erected on the south Denes, about a mile from the town, to the memory of the gallant NELSON. It is of Grecian Doric order, elegantly fluted, and one hundred and forty-four feet in height, ascended by an easy flight of steps. Upon the plinth are the names of the four ships, "Vanguard, Captain, Elephant, and Victory," on board which the heroic Admiral's flag was so valorously displayed; and on the coping of the terrace are inscribed the names of the four principal battles—"Aboukir, St. Vincent, Copenhagen, and Trafalgar." On each of the four sides of the pedestal is a flight of steps leading to the terrace, which affords a promenade round the shaft. The roof is supported by Caryatides, surrounded by a ball, and a figure of Britannia, admirably cast, holding in her hand a trident and a laurel wreath.

On the west side is a very elegant Latin inscription, from the pen of a Norfolk Gentleman, of which the following is a translation :—

HORATIO LORD NELSON,
Whom, as her first and proudest champion in naval fights,
Britain honoured, while living, with her favour,
and, when lost, with her tears;
Of whom, signalized by his triumphs in all lands,
the whole earth
stood in awe on account of the tempered firmness of his
counsels, and the undaunted ardour of his courage;
This great man
NORFOLK
Boasts her own, not only as born there of a respectable family,
And as there having received his early education,
But her own also in talents, manners, and mind,
The glory of so great a name though sure long to
Outlive all monuments of brass and stone,
His fellow-countrymen of Norfolk have resolved to commemorate
By this column, erected by their joint contributions.
He was born in the year 1758;
Entered on his Profession in 1771;
And was concerned in nearly 150 Naval Engagements with the enemy.
Being Conqueror, among various other occasions,
At Aboukir, August, 1798;
At Copenhagen, April, 1801;
And at Trafalgar, October, 1805:
Which last Victory, the crown of so many glorious achievements,
He consecrated by a death, equally mournful to his country,
And honourable to himself.

FINIS.

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ERRATA AND ADDENDA.

Page 43, line 10, instead of northward, *read* eastward.
line 17, instead of southward, *read* westward.
Page 53. Observations in addition to line 20:—Wind blowing from the east produces these effects to a greater extent than from the north-east, and wind blowing from the south-east causes the sand on the sea-shore to be extremely loose and porous, while the north wind renders the sand firm, solid, and compact.
Page 68, line 18, *read* two hundred and ten, instead of one hundred and sixty.
Page 71, line 15, *read* from the north-west o the south-east.
Page 85, line 17, *read* hath instead of have.

Plate the second (opposite p. 71, chap. x.), conveys only a slight idea of the Author's plan, but illustrates the proposed elevation of the beach.